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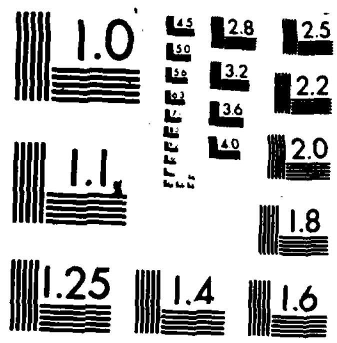

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CR 84.009

NAVAL CIVIL ENGINEERING LABORATORY
Port Hueneme, California

Sponsored by
NAVAL FACILITIES ENGINEERING COMMAND

USER'S MANUAL FOR SAC-3: A THREE-DIMENSIONAL NONLINEAR, TIME DEPENDENT SOIL ANALYSIS CODE USING THE BOUNDING SURFACE PLASTICITY MODEL

December 1983

An Investigation Conducted by
UNIVERSITY OF CALIFORNIA, DAVIS

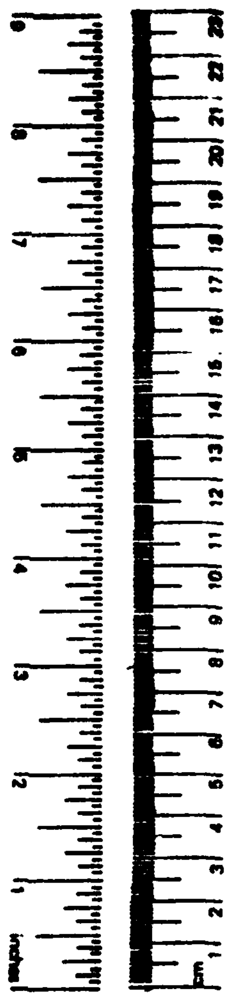
N62583-83-M-T062

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

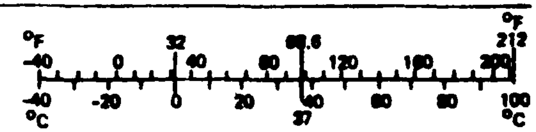
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2,000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1,000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The equations governing the consolidation, and the stress and strains states for soil structures are reviewed and their historical development is discussed. Numerical analysis concepts are used to express these equations in incremental form. A variational statement of these incremental equations is formulated and used in the development of a comprehensive		

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finite element analysis. The concepts used in developing the variational statement are somewhat different from those used by most other investigators and appear to offer certain advantages for inelastic formulations. Finally results obtained with the finite element analysis are compared to known solutions with good results.

For the convenience of the reader the total report on the project is presented in four parts. As noted above a description of the consolidation theory and certain theoretical features of the finite element analysis are described in the body of the main report (CR 84.006). The second part (CR 84.007) describes the numerical evaluation of the incremental form of the bounding surface model. Finally "user's manuals" for the 2-D and 3-D finite element programs are given in two additional reports (CR 84.008 and CR 84.009).

TABLE OF CONTENTS

I. INTRODUCTION

The finite element code may be used to analyze three-dimensional quasi-static soil problems, including consolidation effects. The soil may be modeled using either linear elasticity or the "bounding surface plasticity model for cohesive soil". The program is written in modular form so that other soil models can be easily incorporated. The theory underlying the analysis is described fully in the accompanying report [1].

This user's manual is divided into six parts: Introduction, Input, Output, Explanatory Comments, References, and Examples. The Input section gives in outline form, the sequence of information required to describe the problem to be analyzed. Only the briefest notes of explanation are included in this section. Until an analyst becomes familiar with the program he or she will need to refer to the Explanatory Comments section of the manual where detailed explanations and examples are given. The manual assumes general familiarity with finite element methods; novices in this area are referred to a standard text such as [2].

II. INPUT

<u>General Comments</u>

Three-dimensional problems require large amounts of input data, and the probability of errors due to formatted input records and multi-line record lengths is greater than for the two-dimensional case. Therefore, with the exception of the title record, all input to the three-dimensional program is performed with <u>listed directed READ statements</u> (i.e. free-format). Those users who are not familiar with list-directed input are advised to study the example input files carfully, and to consult the appropriate FORTRAN-77 documentation for the computer being used. In particular, list-directed input records may span several lines (since input is terminated not by line boundaries, but by exhaustion of the input list), multiple spaces between input fields are ignored, and "null" fields in the input record may leave the value of the variable unchanged (as opposed to setting it to zero). The safest way to avoid errors is to include explicit values for all input variables that are being read: this will insure that the correct problem is being solved.

Throughout the Input section of this manual, the following convention is used: fields within a record are listed in order, and each field is described by: Type (I = integer, R = real, L = logical), Name, and a (short) Description. Note that (generally) a list-directed read statement will convert an integer value into a real value if the corresponding input variable is real, but will produce some type of error if logical data is detected in a numeric (integer or real) field.

Input Records

A1. Title Record (18A4):

Any information that is to be printed as the title of the problem.

A2. Control Record:

Type	Name		Description
L	IQUIT	=	$\left\{\begin{array}{l}\text{T(rue) - stop}\\ \text{F(alse) - do not stop}\end{array}\right\}$ analysis after mesh generation
R	GRIDW	=	grid generation parameter (0.0 - "isoparametric" grid, 1.0 - "Laplacian" grid)
I	IFLOW	=	$\left\{\begin{array}{l}\text{0 unsaturated problem - no water flow}\\ \text{1 saturated problem - water flow}\end{array}\right.$
R	θ_1	=	parameter controlling numerical integration in time
R	α	=	parameter controlling "reduced" integration of volume term

Upper bounds on dimensions (used to establish dynamic storage allocation, all values except NCOFMX > 0):

Type	Name		Description
I	NFUNMX	$\geq$	no. of history function specifications, Section B1
I	IFUNSZ	$\geq$	grestest no. (M) of points used to describe a given history function, Section B1
I	MATMX	$\geq$	no. of materials, Section B2
I	NCOFMX	$\geq$	no. of initial state descriptions, Section B3
I	NPTMX	$\geq$	the largest node number, Section B4
I	NELMX	$\geq$	max. of $\left\{\begin{array}{l}\text{number of elements (Section B5)}\\ \text{number of patches used to generate surfaces (Section B6)}\end{array}\right.$
I	NDSPMX	$\geq$	no. of node point specifications, Section B7

A3. Gravity Record

Type	Name		Description
R	g	=	magnitude of acceleration due to gravity
I	IH_g	=	history function associated with g
R	θ_{xg}	=	angles (in degrees) made by the direction in which gravity acts and the three positive coordinate axes
R	θ_{yg}		
R	θ_{zg}		
I	IH_θ	=	history function associated with θ_{xg}, θ_{yg} and θ_{zg}

A4. Nonlinear Analysis Record:
(specification of desired iteration options)

Type	Name		Description
I	NONLIN	=	$\begin{cases} 0 & \text{linear problem} \\ 1, 2 & \text{nonlinear problem} \begin{cases} \text{is} \\ \text{is not} \end{cases} \end{cases}$ terminated if convergence does not occur
R	$0.0 \leq \beta \leq 0.5$	=	parameter controlling Newton-Raphson approximation (0.0 gives the tangent stiffness method; 0.5 gives the method of successive approximation)
I	ITMAX	=	maximum number of interations permitted in any single solution increment (default value = 5)
I	IRPET	=	$\begin{Bmatrix} 0 \\ K \end{Bmatrix}$ reform stiffness matrix every $\begin{Bmatrix} \text{iteration} \\ \text{K-th iteration*} \end{Bmatrix}$
L	ITFAC	=	$\begin{Bmatrix} \text{T(rue)} \\ \text{F(alse)} \end{Bmatrix}$ variable acceleration factor applied to solution vector components
R	FL	=	places limits of $1/FL \geq (\ ) \geq FL$ on the acceleration factor when ITFAC = T (default value = 0.3)
R	ERMAX	=	convergence criterion for the solution vector (default value = 0.01)

---

* after the 2nd

Block Input Sections

B1. **A record with a 1 (integer one) in the first field and padded with sufficient zeros (see Explanatory Comments section), followed by (if no history function specifications are required, this sequence of records is omitted entirely):**

History Function Descriptions: The following cards are required for each distinct function (History functions numbered -3, -2, -1 and 0 are explicitly defined in the program, see Explanatory Notes, and thus no input is required):

1st Record:

Type	Name		Description
I	KINDAT	=	must be set to 0 (zero)
I	IH	=	function number (>0)
I	M	=	number of points used to define the function

2nd record:

	Type	Name	Description
M*	R	F_m	function value
	R	t_m	time corresponding to F_m

This record includes as many fields as necessary to specify the M pairs of values (F_m,t_m), $m=1 \to M$ which define the history function.

B2. **A record with a 2 (integer two) in the first field and padded with sufficient zeros (see Explanatory Comments section), followed by:**

Material Properties: The following information must be supplied for each distinct material:

1st Record:

Type	Name		Description
I	KINDAT	=	must be set to 0 (zero)
I	NMAT	=	material number
I	ITYP	=	1 - isotropic linear-elastic 2 - anisotropic linear-elastic 3 - bounding surface plasticity model for cohesive soil
R	ρ_s	=	soil density+
R	ρ_f	=	fluid density++
R	Γ	=	bulk modulus for fluid and soil particles (default value = 10^6)
R	k^*_{11}		
R	k^*_{12}		
R	k^*_{13}	=	effective soil permeability coefficients
R	k^*_{22}		
R	k^*_{23}		
R	k^*_{33}		

\+ If the acceleration of gravity (g - Section A3) is taken as unity then ρ_s and ρ_f are unit weights.

++ If it is desired to use "excess" not total pore water pressure then ρ_f is set equal to zero - see explanatory comments.

2nd Record (Material Properties):

(Fields Required: 2 (ITYP = 1), 21 (ITYP = 2), 19 (ITYP = 3))

Type	Name ITYP = 1	ITYP = 2	ITYP = 3
R	E	D_{11}	λ
R	ν	D_{12}	κ
R		D_{13}	M_c
R		D_{14}	R_c
R		D_{15}	A_c
R		D_{16}	T
R		D_{22}	P_ℓ
R		D_{23}	ν or G
R		D_{24}	
R		D_{25}	P_a
R		D_{26}	Γ (Duplicates value on "1st card")
R		D_{33}	m
R		D_{34}	h_c
R		D_{35}	h_2
R		D_{36}	$n = M_e/M_c$
R		D_{44}	$\mu = h_e/h_c$
R		D_{45}	$r = R_e/R_c$
R		D_{46}	$a = A_e/A_c$
R		D_{55}	C
R		D_{56}	s
R		D_{66}	

B3. **A record with a 3 (integer three) in the first field and padded with sufficient zeros (see Explanatory Comments section), followed by:**

<u>**Initial State Descriptions:**</u> The following information must be supplied for each non-trivial initial state (this section is omitted if no information is required)*

Type	Name		Description
I	KINDAT	=	must be set to 0 (zero)
I	ISNO	=	inital State Number
R	a_1		
R	a_2	=	initial <u>effective</u> stress distribution for σ_x of the form $\sigma_x = a_1 + a_2x + a_3y + a_4z$
R	a_3		
R	a_4		
R	b_1		
R	b_2		
R	b_3	=	initial <u>effective</u> stress distribution for σ_y of the form $\sigma_y = b_1 + b_2x + b_3y + b_4z$
R	b_4		
R	c_1		
R	c_2	=	initial <u>effective</u> stress distribution for σ_z of the form $\sigma_z = c_1 + c_2x + c_3y + c_4z$
R	c_3		
R	c_4		
R	d_1		
R	d_2	=	initial pore pressure distribution of the form $h = d_1 + d_2x + d_3y + d_4z$
R	d_3		
R	d_4		
R	e_1		
R	e_2	=	initial void ratio distribution of the form $e = e_1 + e_2x + e_3y + e_4z$
R	e_3		
R	e_4		

B3 (Continued)

Type	Name		Description
R	f_1		
R	f_2	=	initial preconsolidation pressure distribution of the form $p_o = f_1 + f_2 x + f_3 y + f_4 z$
R	f_3		
R	f_4		

---

* The initial state of $\sigma_x = \sigma_y = \sigma_z = h = e = p_o = 0$ is built into the program as initial state number 0 (zero).

B4. **A record with a 4 (integer four) in the first field and padded with sufficient zeros (see Explanatory Comments section), followed by:**

Node Geometry Information: As many records as are necessary to specify locations for all nodes which are not to be generated with the "surface" and "interior" generation schemes.

Type	Name		Description	
I	KINDAT	=	must be set to 0 (zero)	
I	N	=	node point number	
R	X	=	x - coordinate	
R	Y	=	y - coordinate	
R	Z	=	z - coordinate	
I	INC	=	numbering increment	quantities associated with the straight and curved line generation options
R	D	=	spacing ratio	
R	XC	=	coordinates of some point on the interior of the circular arc	
R	YC			
R	ZC			

B5. **A record with a 5 (integer five) in the first field and padded with sufficient zeros (see Explanatory Comments section), followed by (this section may be omitted entirely if no surface generation is needed):**

Surface Patch Generation Information: As many records as necessary to specify the patches required to generate all surface nodes:*

Type	Name		Description
I	KINDAT	=	must be set to 0 (zero)
I	N1	=	the numbers of the four nodes points which describe the quadrilateral or triangular** surface patch
I	N2		
I	N3		
I	N4		
I	LIM1	=	number of additional patch layers in 1-direction
I	INC1	=	numbering increment in 1-direction
I	LIM2	=	numbers of additional patch layers in 2-direction
I	INC2	=	numbering increment in 2-direction

---

* this surface patch generation scheme is similar in form to the element generation scheme used in the two-dimensional program SAC-2

** for a triangular patch the fourth node number is set equal to the first

B6. A record with a 6 (integer six) in the first field and padded with sufficient zeros (see Explanatory Comments section) followed by:

Element Information: As many records as necessary to specify all elements in the system*

Type	Name		Description
I	KINDAT	=	must be set to 0 (zero)
I	N1		
I	N2		
I	N3		
I	N4	=	The numbers of the eight node points which describe the brick element. The numbering can begin at any of the nodes and proceed in any direction, but must occur in a consistent sequence (see figure 1). Various degenerate forms between a brick and a tetrahedron can be obtained by repeating node numbers (see figure 2).
I	N5		
I	N6		
I	N7		
I	N8		
I	MN	=	material number (corresponding to the appropriate material description of section B2)
I	ISNO	=	initial state number (corresponding to the appropriate initial state description of section B3)
I	LIM1	=	number of additional element layers in 1-direction
I	INC1	=	numbering increment in 1-direction
I	LIM2	=	number of additional element layers in 2-direction
I	INC2	=	numbering increment in 2-direction
I	LIM3	=	number of additional element layers in 3-direction
I	INC3	=	numbering increment in 3-direction

---

* The order of the element records need bear no relation to the actual location of the elements within the body. The order will determine the assigned "element numbers."

B7. A record with a 7 (integer seven) in the first field and padded with sufficient zeros (see Explanatory Comments section) followed by:

Node Point Specifications: As many records as necessary to specify known node displacements, loads, water flows and pore pressures.

Type	Name		Description
I	KINDAT	=	must be set to 0 (zero)
I	KK	=	node number (for generation - number of 1st node in sequence)
I	KK1	=	final node number in 1-direction (quantities associated with generation option*)
I	INC1	=	increment for 1-direction (quantities associated with generation option*)
I	KK2	=	final node number in 2-direction (quantities associated with generation option*)
I	INC2	=	increment for 2-direction (quantities associated with generation option*)
I	IH_1	=	history function number (section B1) for the 1-coordinate direction
I	IF_1	=	$\left.\begin{matrix}0\\1\end{matrix}\right\}$ indicates that a known $\left\{\begin{matrix}\text{force}\\\text{displacement}\end{matrix}\right\}$ is specified in the 1-coordinate direction
R	V_1	=	magnitude** of the specified $\left\{\begin{matrix}\text{force}\\\text{displacement}\end{matrix}\right\}$ for the 1-coordinate direction
I	IH_2	=	history function number (Section B1) for the 2-coordinate direction
I	IF_2	=	$\left.\begin{matrix}0\\1\end{matrix}\right\}$ indicates that a known $\left\{\begin{matrix}\text{force}\\\text{displacement}\end{matrix}\right\}$ is specified in the 2-coordinate direction
R	V_2	=	magnitude** of the specified $\left\{\begin{matrix}\text{force}\\\text{displacement}\end{matrix}\right\}$ for the 2-coordinate direction
I	IH_3	=	history function number (Section B1) for the 3-coordinate direction
I	IF_3	=	$\left.\begin{matrix}0\\1\end{matrix}\right\}$ indicates that a known $\left\{\begin{matrix}\text{force}\\\text{displacement}\end{matrix}\right\}$ is specified in the 3-coordinate direction

B7. Node Point Specifications (continued):

Type	Name		Description
R	V_3	=	magnitude** of the specified $\left\{\begin{matrix}\text{force}\\ \text{displacement}\end{matrix}\right\}$ for the 3-coordinate direction
I	IH_4	=	history function number for flow/pressure
I	IF_4	=	$\left.\begin{matrix}0\\1\end{matrix}\right\}$ indicates that a known $\left\{\begin{matrix}\text{water flow}\\ \text{pore water pressure}\end{matrix}\right\}$ is specified
R	V_4	=	magnitude** of the specified $\left\{\begin{matrix}\text{water flow}\\ \text{pore water pressure}\end{matrix}\right.$
R	θ_1		
R	θ_2	=	rotation angles (in degrees) defining the rotated coordinate system (associated with rotation option*)
R	θ_3		
R	a_1		
R	a_2	=	coefficients for distribution of applied normal stress*** of the form $\sigma_n = a_1 + a_2x + a_3y + a_4z$ (associated with condensed pressure option*)
R	a_3		
R	a_4		
R	b_1		
R	b_2	=	coefficients for distribution of water source *** of the form $q = b_1 + b_2x + b_3y + b_4z$ (associated with condensed flow option*)
R	b_3		
R	b_4		

---

* This option is suppressed by setting all corresponding values to zero.

** In all cases the actual value of the prescribed quantity is the product of the "magnitude" and the value of the specified "history function"

*** The forces/flows condensed from the pressure/source distribution are multiplied by the value of the appropriate history function in fields IH_1, IH_2, IH_3/IH_4 (See Explanatory comments section).

B8. **A record with an 8 (integer eight) in the first field and padded with sufficient zeros (See Explanatory Comments section) followed by:**

Solution History Segment Data: One record for each history segment into which the incremental analysis is divided:*

Type	Name		Description
I	KINDAT	=	must be set to 0 (zero)
I	NMIS	=	number of solution (time) increments into which the history segment is subdivided
R	TIME	=	time at the end of the history segment
R	D	=	incrementing ratio controlling the timestep lengths within the history segment (default value = 1.0)

C. **End Record**

A record with a 9 (integer nine) in the first field, padded with sufficient zeros (see Explanatory Comments section).

The above sequence of records A1 → C are repeated for each additional analysis in the "stack".

---

* note that the analysis begins at time $t_o = 0$

III. OUTPUT

The output from the program consists of an echo print of material properties and solution parameters, the generated node and element data, messages for detected data errors, and finally for each time step the problem solution. When data errors are detected, the program aborts the job after the printing of the input data and proceeds to the next job in the stack of data.

The printout of the node point specifications includes any concentrated node point forces (in x-y-z coordinates) resulting from specified surface pressures and concentrated flows resulting from specified surface sources.

The printed values of strains, stresses, etc., at any given time step, are the values accumulated to that point in time including initial values. The stresses are effective stresses (tension positive). The pore water pressure (units of stress - compression positive) will be either total pressure or "excess" pressure depending on user preference, see Section B2 in part IV.

The headings for the solution output, are self explanatory with the possible exception of h, which denotes the pore water pressure.

IV. EXPLANATORY NOTES REGARDING THE INPUT

General Comments:

It is the responsibility of the user to maintain consistent units. The units used to describe gravity (Section A3), and the material properties (Section B2) must be consistent with those used to describe the initial state (Section B3), the geometry of the body (Section B4), and the node point specifications (Section B6). The solution is expressed in the same units as the input.

Because the bandwidth NBAND of the simultaneous equations is determined by the numbering of the nodes, an optimal node numbering scheme is required to minimize the computational cost of a given finite element analysis. The bandwidth resulting from a given numbering scheme is computed in the following manner:

i) Denote the span for any two nodes of a given element as N_i, where N_i is equal to the absolute difference in the node numbers.

ii) Denote the maximum value of N_i for a given element j as NE_j.

iii) Considering all elements in the system, denote the maximum value of NE_j as NE_{max}.

iv) The bandwidth is then given by the expression NBAND = (3 + IFLOW) * (NE_{max} +1)

Since NE_{max} is directly related to the bandwidth of the simultaneous equations, in numbering the nodes it is this quantity that should be minimized.

Section-by-Section Comments:

The section numbers used below correspond to the section numbers of part **II. INPUT**, thus, in order to find information concerning the input for B7 (Node Point Specifications) the reader should refer to Section B7 below. In addition, within a given section items called out in the input are typed in bold.

For example input items **β** and **ITMAX** which are required for input Section A4 are type in bold where they are discussed below in Section A4. The theory underlying the analysis is only superficially treated here; for a more complete discussion the reader is referred to [1].

A1. Title Record

The title serves to identify the particular problem under consideration. This record must lie on one 72-column line.

A2. Control Record

If a T(rue) value is specified for **IQUIT** the analysis terminates after the mesh has been generated and printed. This option should be used for the first run of a large problem in order to avoid wasting computer time analyzing incorrect data. If data for several problems is contained in the stack, the program skips the time history data for the terminated job and proceeds to the next problem.

For the precise meaning of the grid generation parameter **GRIDW** the reader is referred to [3] (**GRIDW** = 1.0 - w, where w is defined in [3]). In general a value of **GRIDW** = 0.0 is recommended; for those very rare cases where this results in a singular set of equations for the grid generation process, a value of .05 is recommended.

The code **IFLOW** distinguishes between saturated conditions where water flow occurs (or a potential for water flow exists - ideal undrained conditions) and unsaturated conditions.

When **IFLOW** = 1 the soil density (or unit weight if the acceleration of gravity is taken to be unity) ρ_s specified in Section B2, refers only to the soil skeleton (unsaturated soil). The printed stresses are the "effective stresses" and must be supplemented by the pore water pressure to obtain the total stresses. If it is desired to exactly model "ideal undrained conditions" (no movement of

water), the effective permeability of the soil should be set equal to zero (Section B2).

When **IFLOW** = 0 the soil density ρ_s must include the mass (or weight) of any water present in a partially saturated soil (the pore water pressure is assumed to be zero and water is assumed not to flow). The printed stresses are total stresses.

Conditions where part of the soil mass is unsaturated and part is saturated can be modeled by specifying for the unsaturated soil a very small bulk modulus Γ for the water (and soil particles - Section B2).

The parameter θ_1 determines the approximation used for the time derivatives in the governing equations (see [1]); values between 0.5 (Crank-Nicolson) and .67 (Galerkin) are recommended [2]; with the latter value preferred when solution oscillation is a problem.

The parameter α determines the finite element approximation used for measuring volume change (see [1]). When **IFLOW** = 0 a value of 0.0 is recommended unless solution oscillation is a problem in which case a value of .1 may be beneficial. Except for nearly incompressible linear elastic materials, when **IFLOW** = 0 a value of 1.0 is usually preferable.

All arrays in the program whose dimensions are problem dependent, are dynamically dimensioned. The values **MATMX, . . . NDSPMX** contain information for this purpose. All these quantities, with the exception of NCOFMX, must be greater than zero. The values of MATMX, etc. are upper bounds and thus, unless it is desired to absolutely minimize storage requirements, need not be equal to the actual number of specified materials, etc. The quantity NELMX must be an upper bound both for the number of elements in the system and the number of "patches" used in Section B5 for surface generation purposes; it must be an upper bound individually to these quantities not their sum. When specifying

the values of NELMX and NDSPMX it must be remembered to count those elements (or patches) and node point specifications which are included by means of the generation options.

In the dynamic dimensioning of the program, separate arrays were used for integer and floating point numbers in order to avoid difficulties for computer that use different word lengths for the two. The program has been coded so that 16 bit integers may be used if desired.

The dimensions of the program are controlled by two quantities "long" and "longi" specified in "assignment" statements at the beginning of the program; these quantities must satisfy the following inequalities.

longi $\geq$ NFUNMX + NPTMX + 9*NELMX + (4+IFLOW)*NDSPMX + 1

long $\geq$ 31*MATMX + 2*NFUNMX*IFUNSZ + 24*(NCOFMX + 1) + [3 + 4*(3 + IFLOW)]*NPTMX + (6 + IFLOW)*NDSPMX + LONGEQ

Where LONGEQ is the space set aside for solving the system of equations by means of a block, constant bandwidth equation solver. If the bandwidth of the equations is denoted as NBAND, then the minimum value for LONGEQ is NBAND *NBAND (only a single equation would be contained in each equation block); if it is desired to solve the equations entirely in core then it must have a value $\geq$ NBAND * (3 + IFLOW) *NPT. In general it is recommended that LONGEQ exceed the minimum by at least 30%. The calculation of the bandwidth NBAND is discussed in the general comments at the beginning of this part of the manual.

A3. Gravity Record

Gravity **g** can be input either in terms of the acceleration units appropriate to the system of units selected for the problem (32.2 ft/sec^2 for English units) or in terms of multiples of the acceleration of gravity at sea level (i.e. g = 1 for a field structure); the corresponding meanings of ρ_s and ρ_f (Section B3)

would be mass densities in the first case and unit weights in the second. That is, the product ρg must have units of weight per unit of volume.

The histories of the magnitude g and direction (θ_{xg}, θ_{yg}, θ_{zg}) of gravity are specified by the history function numbers (Section B1) $\mathbf{IH_g}$ and $\mathbf{IH_\theta}$. A pre-existing gravity loading of a field deposit can be modeled by initializing the stresses and pore water pressure (Section B3) to their proper values and setting $IH_g = IH_\theta = -3$. The history of the effective gravity loading on a centrifuge model during "spin-up" can be modeled by describing in Section B1 a history function corresponding to the centrifuge velocity history for the test; in the case of a fixed bucket both g and θ_g would vary with time, while for a swing-up bucket only g would vary.

A4. Nonlinear Analysis Record

For a linear elastic problem, **NONLIN** and all other input quantities for the record are set equal to zero. For problems using the bounding surface plasticity model, NONLIN is set equal to 1 or 2 depending on whether the analysis should be terminated or not, if convergence is not achieved in a given time step.

The factor β determines the approximation to be used for the Jacobian in the Newton-Raphson's iteration for the nonlinear problem, for details the reader is referred to [4, 5]. It is expected that a value of 0.0 will in most cases give the best results.

The frequency of updating the stiffness matrix during the iteration process is controlled by the value of **IRPET** [4]; for initial uses of the program a value of zero would appear to be appropriate. The values of **ITFAC** and **FL** control the use of acceleration factors applied to the components of the solution vector [4]; for initial use of the program it is suggested that ITFAC = F. Finally,

the default value of .01 for the convergence limit **ERMAX** would appear to be adequate for most problems.

Block Input Section

The rest of the input data for a given analysis occurs in a block mode, i.e., all the data for history functions (for example) is placed in one block, all the material properties in another, etc. Each block is preceeded by an input record with a single integer in the range 1 thru 9 in the first field. This integer flag serves to instruct the program as to the type of data that follows and is characteristic of the finite element codes which have been developed at UCD and which form the basis for this three-dimensional code. However, because a list-directed READ statement (used for input to the program) will ignore line boundaries, each record containing the integer flag for a new block of data must be padded with sufficient zeros so that the record contains at least as much data as the previous records (from the previous block). To be specific, consider the following case: The input block for node coordinates is finished and input to the surface patch data block is to be read:

Case 1: (error)

```
0  65  1.75  2.38  5.39  4  1.0  0.0  0.0  0.0     (last node coordinate record)
5                                                   (integer flag for patch data)
0  1   6   7   2   3   1   2   4   5                (1st record for patch data)
```

The program would read the 5 (indicating patch data follows), and in addition, would continue until it exhausts the input list (for node coordinates), somewhere towards the end of the 1st patch record. At this point, the program and the analyst would have different opinions as to what problem is being solved.

This difficulty is easily solved in one of three ways. In the first procedure, the input record with the integer flag is padded with sufficient zero fields so

that the input list (for node coordinates, in this case) is exhausted and the next read statement finds the 1st record for patch data:

<u>**Case 2:**</u> (correct - method #1)

0	65	1.75	2.38	5.39	4	1.0	0.0	0.0	0.0	(node coordinates)
5	0	0	0	0	0	0	0	0	0	(flag for patch)
0	1	6	7	2	3	1	2	4	5	(patch)

This method is portable, easy to implement, and is used in all the problems in the Example section. A second method can be used in environments where a mechanism for terminating an input list is available. For instance, a (/) character will terminate the read list on many computers:

<u>**Case 3:**</u> (correct - method #2)

```
0  65  1.75  2.38  5.39  4  1.0  0.0  0.0  0.0
5  /
0  1  6  7  2  3  1  2  4  5  0
```

This second method helps to delineate the block structure of the input file; a check of the appropriate FORTRAN - 77 documentation will uncover any details needed for a particular computer.

Finally, the third method is the safest and may be the easiest to use, especially in environments where the input data is coded on cards: the flag record consists of the integer flag followed by 28 zero fields:

```
5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

This method is motivated by the fact that the longest input record is 29 fields wide (Node Point Specifications). Therefore, a flag card with the flag in field one and zeros in the next 28 fields will always separate any two data blocks. For users accustomed to typical FORTRAN formatted input records, this method is recommended.

Also note that blocks must occur in the order presented in the "Input" section of this manual.

B1. History Function Descriptions

The time dependence of all input quantities (i.e., magnitude and direction of gravity, and specified node point displacements, flows, loads and pore water pressures) are specified by means of appropriate "history functions". The program has built-in four such functions numbered -3 → 0, i.e.,

i) IH = -3 Specifies a unit value and a zero incremental value for <u>all</u> times, Figure 3a.

ii) IH = -2 Specifies a zero value and a zero incremental value for <u>all</u> times - Figure 3b.

iii) IH = -1 Specifies all incremental values equal to 1.0. The incremental values are taken to be equal regardless of the relative lengths of the time steps specified in Section B7. The resulting history functions for the cases of equal and variable length time steps are illustrated in Figure 3c.

iv) IH = 0: Specifies a step-function at time t = 0; that is a quantity using this function is applied entirely during the first solution increment, Figure 3d.

In addition, the user may describe, by means of the input to Section B1, as many more history functions (numbered 1→) as needed; an example of such a function is given in Figure 4.

For a particular history function, linear interpolation is used to identify the ΔF which corresponds to a given time increment Δt. For any solution times beyond the last specified point t_M the final history segment is extended indefinitely.

When a magnitude V and a history function number IH are specified in Section B7 (or A3) for some given external agent, then in the solution interval Δt an incremental value of the quantity equal to $V*\Delta F$ is applied, where ΔF corresponds to history function IH.

B2. Material Properties

The units of the material properties must be consistent with the units used to describe the geometry of the body and the magnitudes of the applied loads.

The material number **NMAT** serves as an identifier for use in Section B6 to assign a particular material description to a group of elements. In the current version of the program three types of material descriptions are permitted, i.e., istropic or anisotropic, linear elastic and the bounding surface plasticity model for cohesive soils. Additional material models can be easily added to subroutine PROPTY by extending the two key "Block IF" statements as indicated in the program by comment statements.

As noted previously (in Section A3), the units of ρ_s and ρ_f must be compatible with the units selected for gravity "g".

Flow problems (IFLOW=1) can be expressed either in terms of total or excess pore water pressure. In the first case ρ_f must be set equal to the fluid density (or unit weight - see previous paragraph); in the second case it is set equal to zero.

The quantity Γ can be viewed either as the combined bulk modulus of the soil particles and the pore water, or as a penalty number imposing an assumed incompressibility condition for these components [1, 2, 6]. In the absence of experimental evidence, the bulk modulus for water (3.2×10^5 psi, 2.2×10^9 N/m^2) may be used for Γ.

The "effective" permeability coefficients k^*_{ij} appear in Darcy's law† when units of pressure (not head) are used for the pore water pressure; their relationships to the permeability coefficients commonly used by civil engineers and those used by physicists are discussed in [1].

For isotropic, linear elasticity E and ν denote Young's modulus and Poisson's ratio respectively. The linear, anisotropic elastic law is written in the form:

$$\begin{Bmatrix} \sigma_x \\ \sigma_y \\ \sigma_z \\ \tau_{xy} \\ \tau_{yz} \\ \tau_{xz} \end{Bmatrix} = \begin{bmatrix} D_{11} & D_{12} & D_{13} & D_{14} & D_{15} & D_{16} \\ D_{12} & D_{22} & D_{23} & D_{24} & D_{25} & D_{26} \\ D_{13} & D_{23} & D_{33} & D_{34} & D_{35} & D_{36} \\ D_{14} & D_{24} & D_{34} & D_{44} & D_{45} & D_{46} \\ D_{15} & D_{25} & D_{35} & D_{45} & D_{55} & D_{56} \\ D_{16} & D_{26} & D_{36} & D_{46} & D_{56} & D_{66} \end{bmatrix} \begin{Bmatrix} \epsilon_x \\ \epsilon_y \\ \epsilon_z \\ \gamma_{xy} \\ \gamma_{yz} \\ \gamma_{xz} \end{Bmatrix}$$

The meanings of the several parameters describing the bounding surface model are described in detail in ref [7-11]; values for particular soils may be found in [8, 11]; a summary of information is given in Table 1. In order to keep the input for the model exactly as described in [10], the parameter Γ is retained even though it is a duplication of previous input (the second value is not used).

B3. Initial State Descriptions

The information in this section is used to establish the initial state of the soil. The values of **h** specified in this section are used directly to initialize the pore water pressure in the elements and indirectly to initialize it for the nodes; see Section B5. It is extremely important to note that σ_x, σ_y and σ_z are "effective" stresses (total stress minus pore water pressure). It is assumed

---

†In terms of excess pore water pressure it has the form

$$v_1 = -\left(k_{11}^* \frac{\partial h}{\partial x} + k_{12}^* \frac{\partial h}{\partial y} + k_{13}^* \frac{\partial h}{\partial z}\right), \text{ etc.}$$

Table I - Summary of Bounding Surface Model Parameters

Symbol	Description of Property	Value for Example Soil [11]	Range of typical values
λ	Slope of isotropic consolidation line for an e-ℓn p′ plot	.14	.1 → .4
κ	Slope of elastic rebound line for an e-ℓn p′ plot	.05	.02 → .08
M_c	Slope of critical state line in triaxial space (compression)	1.05	.75 → 1.3
R_c A_c T	Parameters describing shape of bounding surface (compression)	2.96 0.15 .08	2.0 → 3.0 .03 → .2 .05 → .15
P_ℓ	Transitional value of confining pressure separating linear rebound curves on e-ℓn p′ and e-p′ plots. Suggested range of values = $.3P_a \rightarrow 1.0P_a$	6.50 psi	4.0 → 15.0 psi
ν (or G)	Poisson's ratio (or shear modulus)*	(3960 psi)	.15 → .35 (1000 → 10000 psi)
P_a	Atmospheric pressure (used for scaling and establishing units)	14.7 psi	
Γ	Combined bulk modulus for soil particles and pore water	10^6 psi	$10^5 \rightarrow 10^7$ psi
m	Hardening parameter	0.1	0.1
h_c	Shape hardening parameter for compression	0.14	.05 → 2.0
h_2	Shape hardening parameter on the I-axis	.09	.05 → 2.0
$n=M_e/M_c$ $\mu=h_e/h_c$ $r=R_e/R_c$ $a=A_e/A_c$	Ratio of extension to compression values	.81 .31 .74 1.0	.75 → 1.2 .5 → 4.0 .70 → 1.3 .5 → 2.0
C	Projection center variable	.21	0 → .75
S	Elastic zone variable (a value of 1.0 gives no elastic zone)	1.0	1.0 → 2.0

* The user may directly input either ν or G

that the initial shear stresses τ_{xy}, τ_{yz}, and τ_{xz} are zero. For linear elasticity problems the initial stresses may be taken to be zero and then the printed stresses are additions to the initial state (i.e., superposition is valid). However, if the bounding surface model is used, an accurate initiation of the stress state is extremely important.

It must be remembered that σ_x, σ_y and σ_z are negative when compressive, while **h** is positive in compression. The units of h are those of stress. The question of whether h represents total or excess pore water pressure is discussed in Section A3.

The initial states are described by means of simple linear equations in the coordinates x, y and z thus the coefficients $\mathbf{a_1} \rightarrow \mathbf{f_4}$ are dependent on the location selected for the origin of the coordinates.

The specifications of the initial void ratio **e** and the preconsolidation pressure (positive in compression) $\mathbf{P_o}$ are only necessary if the bounding surface model is used; they are "internal variables" for that theory [7].

Node, Patch and Element Data

This program incorporates several devices to facilitate mesh generation. When using these procedures there is a hierarchy to the data that must be observed. First, the locations of the nodes along all edges of the body must be specified (using the straight or arc line generation option, if desired). Once the edges are specified, the surfaces (whose boundaries are these edges) that enclose the volume must be generated. These surfaces are collections of 2-D quadrilateral "patches". Once the surfaces that enclose the whole body are generated, an extension of the 2-D "interior node generation scheme" of Ref. 3 is used to generate the interior nodes.

The analyst is urged to study the example problems carefully to become aquainted with the mesh generation schemes. It should be noted that special

care must be taken to define all the edges and all the surfaces enclosing the body.

B4. Node Geometry Information

The program incorporates three data generation routines to assist the user in defining the locations of the system's node points: the line or arc generation option, the surface node generation option and the interior node generation option. Not all numbers between 1 and the maximum node number NPT need correspond to actual nodes in the body. This feature facilitates the use of the available node and element generation options. If the location of a node is prescribed more than once in the input and the locations are not in agreement, the last description is used. However, if in a second or later description the node number is entered as negative, then the previous location is used. The utility of this option is illustrated later.

The straight line or circular arc coordinate generation option may be used whenever several sequential node points lie along a straight line or circular arc in space. If such a situation exists, it is necessary only to enter the coordinates of the initial and final points of the sequence (denoted by N' and N, respectively), and the values of INC and D. The constant INC represents the difference between any two successive node numbers in the sequence, and D defines the ratio of the distances between any two adjacent pairs of points.

If, for a node N, INC $\neq$ 0, intermediate node points are generated along a straight line (XC = YC = ZC = 0) or a circular arc (XC $\neq$ 0 and/or YC $\neq$ 0 and/or ZC $\neq$ 0) between node N and the point described on the preceeding node specification record N'. That is, the coordinates of the points N' + INC, N' + 2*INC, . . ., N - INC are each automatically found. For the case of a circular arc (flagged by the condition XC $\neq$ 0 and/or YC $\neq$ 0 and/or ZC $\neq$ 0) it is assumed to pass through the end points of the sequence N' and N, and the additional

intermediate point with coordinates (XC, YC, ZC). This intermediate point need not be a node. The node N for which the specified non-zero value of INC triggers the generation of the line N' - N can also serve as the initial point of a line generated between it and the point described by the next record.

The end points of the sequence may be entered in either order. For example, the segments illustrated in Figure 5 could be defined by specifying the nodes in either the order 7 → 22 (INC = 5, D = 2.0) or the order 22 → 7 (INC = -5, D = .5). The spacing of the intermediate points (nodes 12 and 17) is controlled by the spacing ratio D. A value of D = 1.0 would result in equally spaced nodes.

B5. Surface Patch Generation Information

This section is a straightforward generalization of a two-dimensional mesh generation scheme [3] to surfaces in three dimensions. If the node point coordinate section (B4) completely specifies all the surface nodes (see the example section, Terzaghi's problem), then this block of data can be omitted entirely. Under usual conditions, however, it will be needed.

Using this option, nodes on a surface whose boundary nodes have been specified can be automatically generated (the surface need not be a plane). A patch is a 4-node surface element (which can degenerate into a triangle). A surface is described by an assembly of patches arranged in a layered fashion in each of the two surface directions, see Figure 6.

The two directions need not be orthogonal, or be aligned with the coordinate directions. The surface of Figure 6 can be generated in one of a number of ways (it is assumed that the coordinates of the surface boundary nodes 1, 2, 3, 4, 5, 8, 9, 12, 13, 16, 17, 18, 19, 20 have been specified):

Case 1: (original patch defined by nodes 1, 2, 6, 5)

patch record:

0 1 2 6 5 2 1 3 4

Here (as shown in Figure 6) Lim1 = 2 and the 1 direction points from node 1 to node 4, Lim2 = 3 and the 2 direction points from node 1 to node 17.

Case 2: (same original patch as in Case 1)

patch record:

0 1 5 6 2 3 4 2 1

Here, direction 1 and direction 2 are reversed from case 1 (and as shown in Figure 6). Other possibilities arise from choosing a different patch as the starting point. (Note that node numbers can be entered in either a clockwise or a counterclockwise order.)

For simple complete "box-like" bodies, an entire face can be generated with just one patch record. However, for more complicated bodies, several records may be required to specify all the nodes on a given face. For the face pictured in Figure 7, three records (corresponding to surfaces A, B, and C) are required.

The number of patches generated by a single input record is (Lim1 + 1)](Lim2 + 1). The total number of patches defining the surface of the body must not be greater than the dimension upper bound NELMX (the same arrays are used for patch and element generation). Once all the surfaces enclosing the body are specified, the interior node generation scheme automatically (without prompting by the user) locates the coordinates of all the interior nodes.

B6. Element Information

The material number **MN** and the initial state number **ISNO** must correspond to the appropriate descriptions given in Sections B2 and B3. At the time the information for the initial state ISNO is used to initalize h for an element, it

is also used to initialize h for the eight nodes describing the element in question. If different initial states are prescribed for two adjacent elements and they give initial values for h which are not in agreement at the common nodes, the values obtained from the element of higher number prevail. Because in practice h is continuous such ambiguous situations should not often arise.

If the body can be divided into layers of elements, and if the material and the initial state numbers MN and ISNO are the same for several elements within a layer and for several layers, the node numbers of these elements can be simply established by means of the element data generation option. To generate a sequence of elements within a single layer, node points are specified for the first element only, together with appropriate values for **LIM1** and **INC1.** The generation of layers in up to 3 directions at a time is a straightforward extension of this concept (this is similar to the 2-D generation used in Section B5). The total number of elements generated by any one record is (LIM1 + 1)*(LIM2 + 1)*(LIM3 + 1).

Hence, under "ideal" conditions, the element array for an entire body can be defined with only a single record in Section B6. Several of the example problems demonstrate use of the element generation option under different circumstances.

B7. Node Point Specifications

Node specifications for displacements and loads may be given in terms of global (x-y-z) components or rotated (x_1-x_2-x_3) components. If $\theta_1=\theta_2=\theta_3=0.0$, the global system is used. (The rotation convention is described later in this section.)

For each of the three coordinate directions, one may specify the history of either a displacement (**IF** = 1) or a load (**IF** = 0) by setting **V** equal to the magnitude of the applied quantity and **IH** equal to the appropriate history function

number of Section B1. Specified displacements and loads are considered to be positive when they have the same sense as the positive coordinate directions. In addition, either the history of the water flow Q or the pore water pressure h may be specified by giving appropriate values for IH_4, IF_4 and V_4.

In this section four options are available to aid the analyst in data preparation:

A. Generation of a sequence of nodes with the same specifications

B. Specification of a rotated coordinate system

C. Condensation of an applied normal stress to node forces

D. Condensation of a distributed water source to node flows

Whenever a line or surface exists where the node specifications are the same (and the node numbering is regular), option A can be used to generate all the corresponding node specifications with one record. This option can be used to generate such node specification sequences by specifying the beginning node number (**KK**), the final node numbers (**KK1, KK2**), and the numbering increments in the corresponding directions (**INC1, INC2**). To generate specifications along a line, either KK1 or KK2 must be nonzero (and distinct from KK). To generate specifications over a surface, both KK1 and KK2 must be nonzero (and distinct from KK). In either case the appropriate numbering increment(s) INC1 and/or INC2 must be nonzero.

Under normal circumstances, the primary unknowns are the displacement components in the global (x-y-z) coordinate directions. Forces and/or displacements can be specified in a rotated coordinate system by specifying the three rotation angles (in degrees) necessary to transform the global system to the rotated one. A positive rotation is assumed to act in a right-handed sense with respect to the axis of rotation. The cumulative effect of these rotations is the transformation from global coordinates (x,y,z) to doubly-primed local

coordinates (x",y",z") according to the covention shown in Figure 9. Note that these rotations are not commutative, i.e., the rotations must be specified in the order given.

An applied pressure distribution of the form $\sigma_n = a_1 + a_2 x + a_3 y + a_4 z$ can be automatically condensed into specified node forces by inputting the coefficients for σ_n such that $|a_1| + |a_2| + |a_3| + |a_4| \neq 0$. For such a specification to be valid, KK, KK1 and KK2 must be distinct (otherwise there is no area on which the pressure acts). Similarly, a distributed fluid source $q = b_1 + b_2 x + b_3 y + b_4 z$ can be condensed into node flows by specifying coefficients b_i such that $|b_1| + |b_2| + |b_3| + |b_4| \neq 0$.

The sign convention for this condensation is that the distribution is positive (i.e. pressure acts inward, flows enters the body) if σ_n (or q) has a positive sign and the 3 vectors $\underline{v}_1$, $\underline{v}_2$ and $\underline{n}$ form a right-handed system, where $\underline{v}_1$ is the vector from node KK to node KK1, $\underline{v}_2$ is the vector from node KK to KK2, and $\underline{n}$ is an outward pointing normal from the body (see Figure 9), $\underline{v}_1$, $\underline{v}_2$ and $\underline{n}$ will form a right-handed system if $(\underline{v}_1 \times \underline{v}_2) \cdot \underline{n} > 0$. The condensation routine works for flat or curved surfaces, but care should be taken when using it on surfaces with unusual curvature or with degenerate or non-convex shapes. The history functions for the x,y, and z components of the resulting node forces are IH_1, IH_2 and IH_3, respectively: for condensed flows, history function IH_4 is used. When the pressure option is used, V_1, V_2, V_3, IF_1, IF_2, IF_3, and θ_1, θ_2 and θ_3 are ignored. Similarly, if the flow condensation option is used, V_4 and IF_4 are ignored.

Any node may have more than one "Node Point Specification" as long as the cumulative effect of the specifications is correct. For a given node, if one specification is a force and the other a displacement (in the same direction), the displacement specification will prevail. If both specifications were

displacements, the second would prevail. In general, multiple specifications at corners are common. If at a given node it is desired to use two specifications where one involves an applied pressure and the other requires the use of a local coordinate system, then the pressure specification must occur first in the data block.

If $IF_i = V_i = 0$ $(i = 1,2,3,4)$ at a node and there is no pressure or flow prescribed, for economy, no specification is needed and one should not be used.

B8. Solution History Segment Information

The analysis is in general, time dependent due to the consolidation process and the history dependence of the bounding surface plasticity model. For a non-flow problem (IFLOW = 0) the actual rate at which time passes is not important (because the bounding surface model is rate independent), however, for the purpose of modeling the history effects it is still convenient to think in terms of time. For a linear elastic, non-flow problem the only role of time is to represent the loading history; if only final results are desired then only one time step is required.

For convenience, the solution history is broken into one or more history segments. One record is required in Section B8 for each segment. The time at the end of a given segment is denoted as **TIME**; it is assumed that the first segment begins at $t = 0$. The number of time steps into which a given segment is to be divided is prescribed as **NMIS**. Within a given "history segment" the ratio of two successive time steps is equal to the prescribed spacing ratio **D**; a value of 1.0 gives equal time steps. The role of the time step spacing ratio is analogous to the length spacing ratio used in Section B4 and illustrated in Figure 5

The selection of appropriate time step lengths is complicated by the fact that two distinct processes are involved, i.e. water flow and soil plasticity.

Thus a certain amount of experimentation with successively smaller time steps will often be required. In this process several factors should be considered. Abrupt changes in step size should be avoided (judicious use of the spacing ratio D can facilitate smooth transitions from small to large time steps, etc). Abrupt changes in applied loads or displacements will cause large flow gradients and require small time steps. Further information concerning step size for flow problems is to be found in [1,2]. A certain amount of oscillation of the solution is to be expected and usually can be tolerated. A minimum of 10-20 steps are usually required by the bounding surface plasticity model in proceeding from a nearly hydrostatic stress state to failure conditions.

C. End Record

The function of this card is to signal the end of the problem; the program then proceeds to the next stacked job (if any).

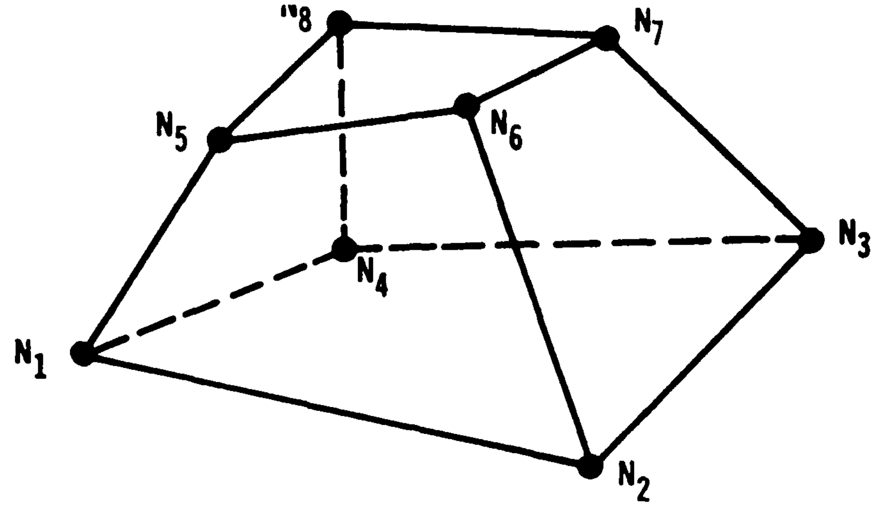

Figure 1. Consistent Nodal Numbering

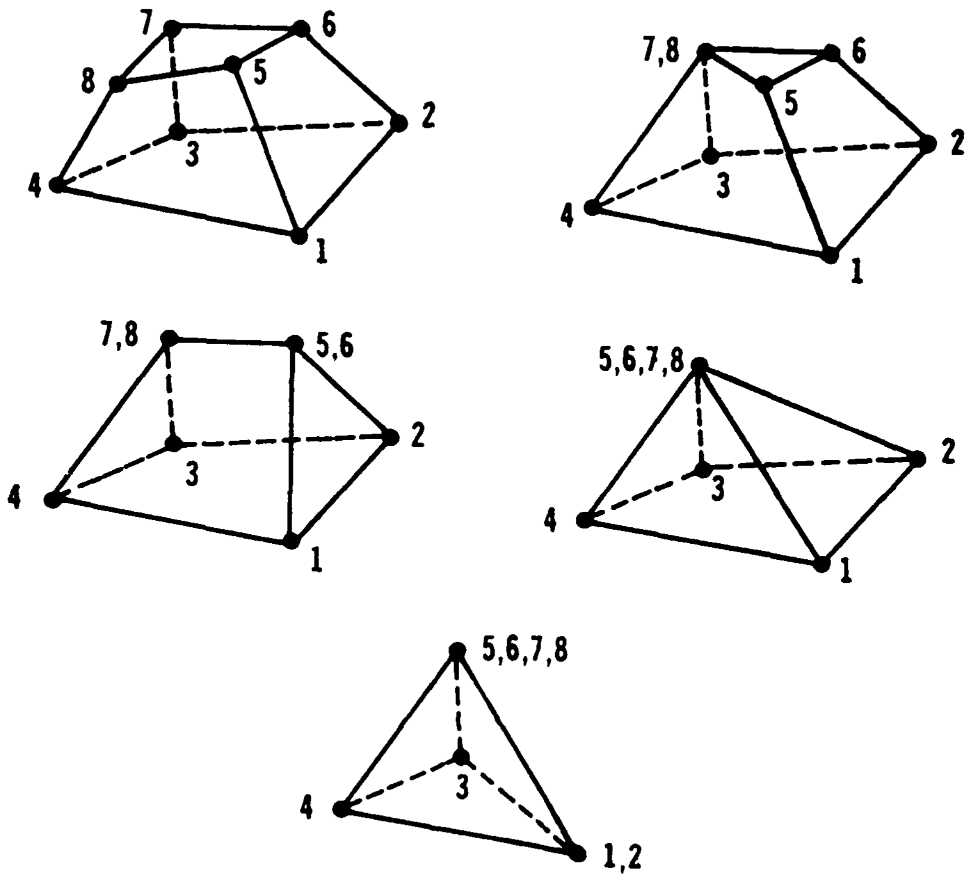

Figure 2. Various Degenerate Forms of Brick Element

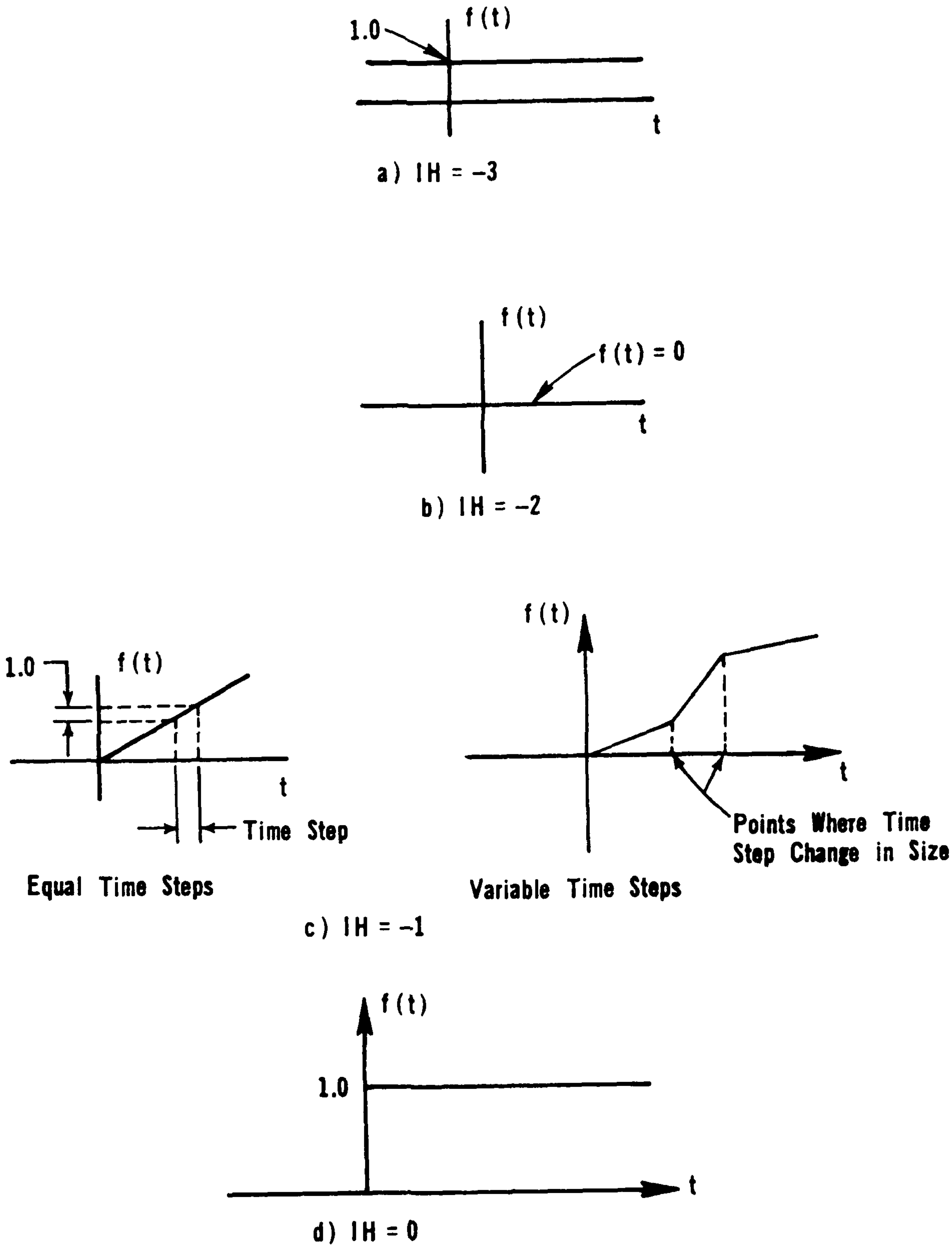

Figure 3. Built-in History Functions

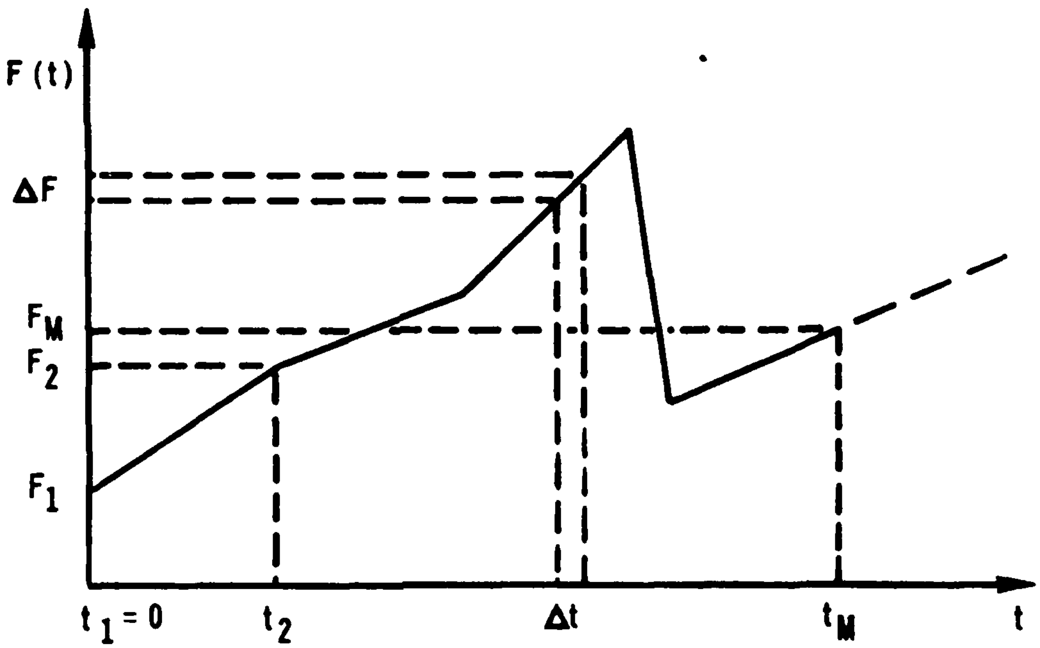

Figure 4. Typical User Specified History Function

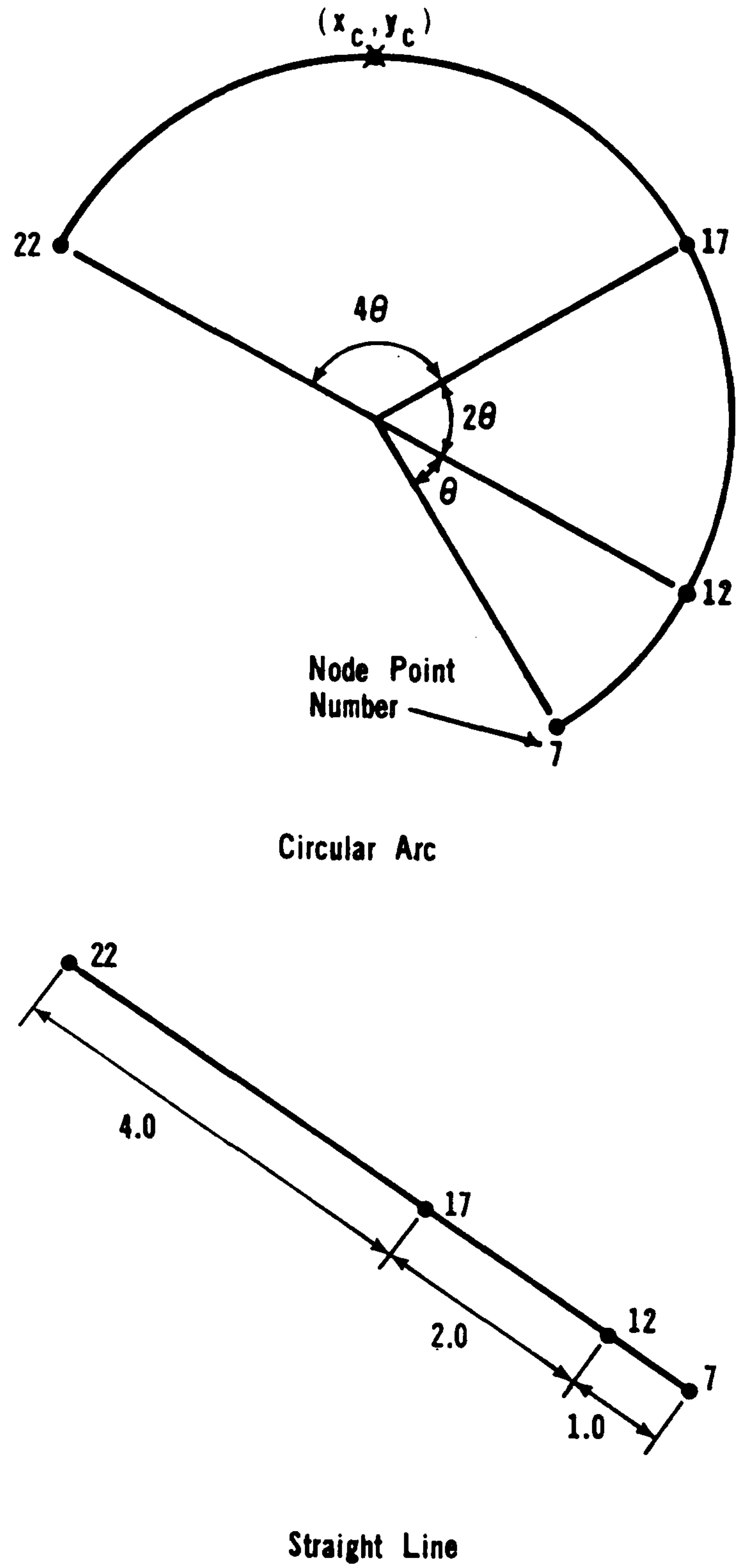

Figure 5. Examples of Line Generation

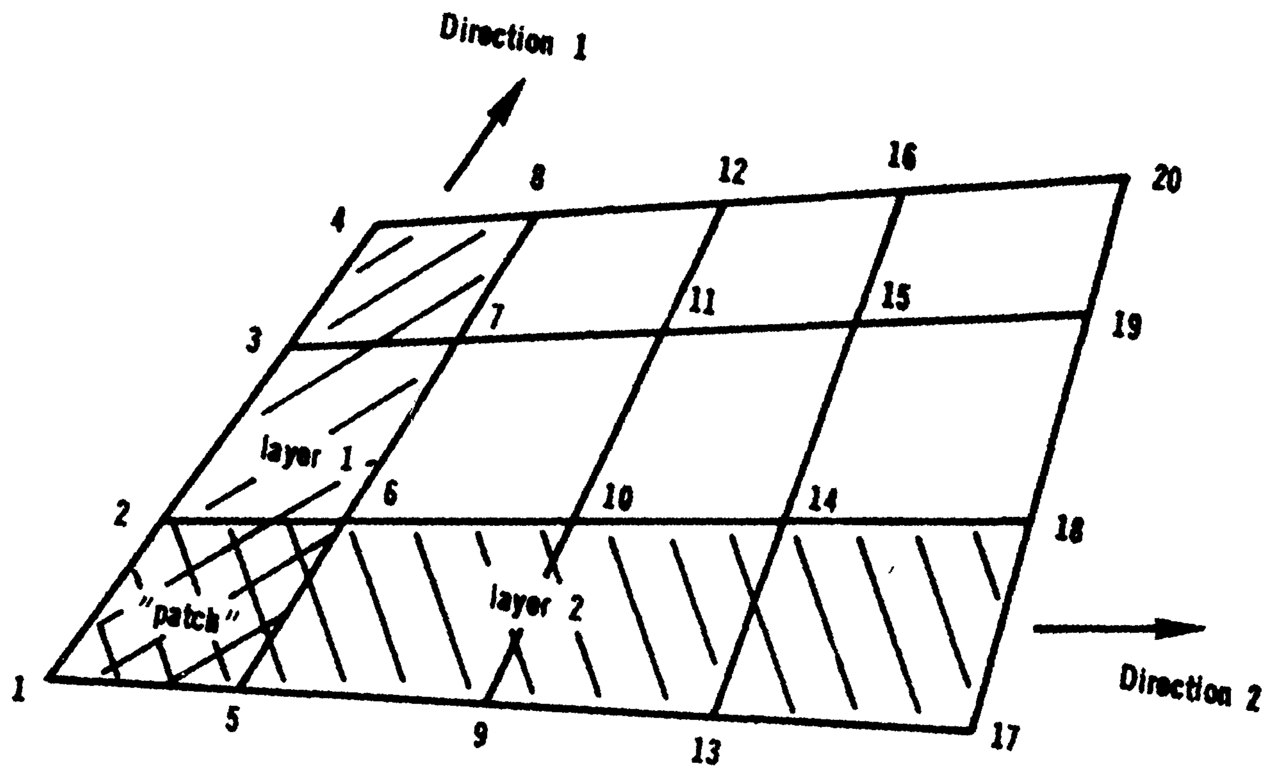

Figure 6. Surface Defined by "patches"

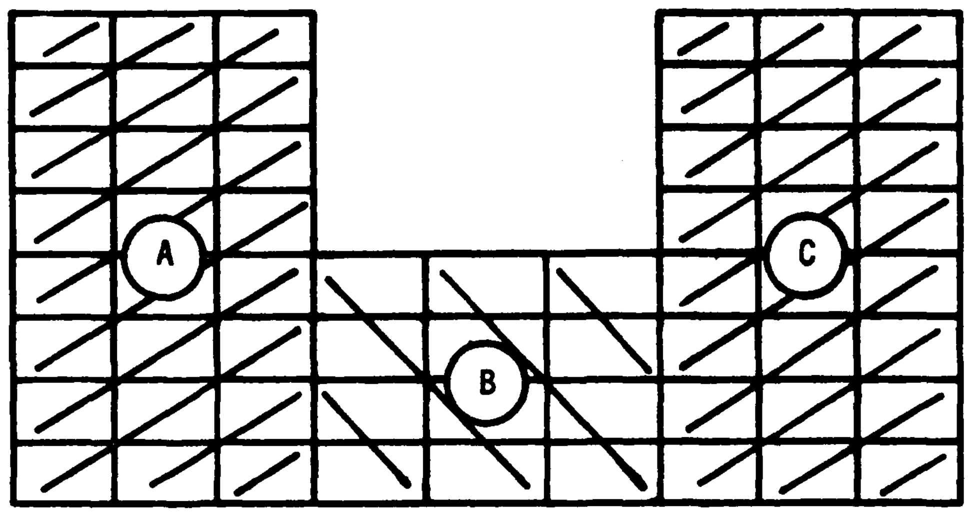

Figure 7. Face Composed of Several Surfaces

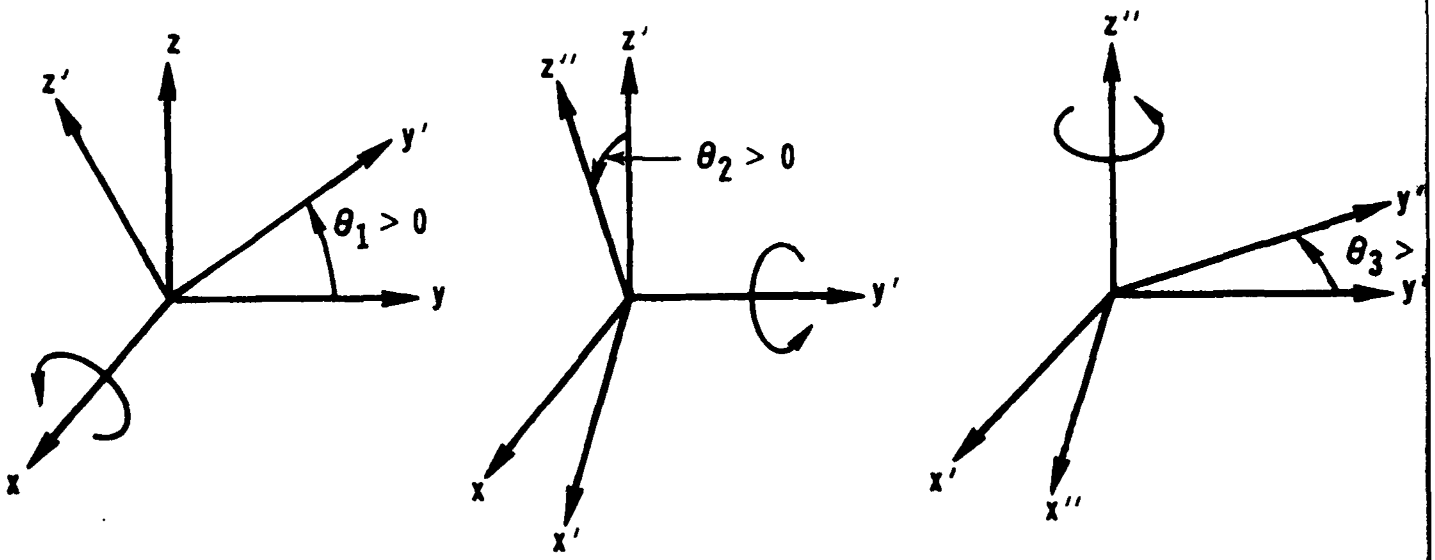

Figure 8. Rotation Convention

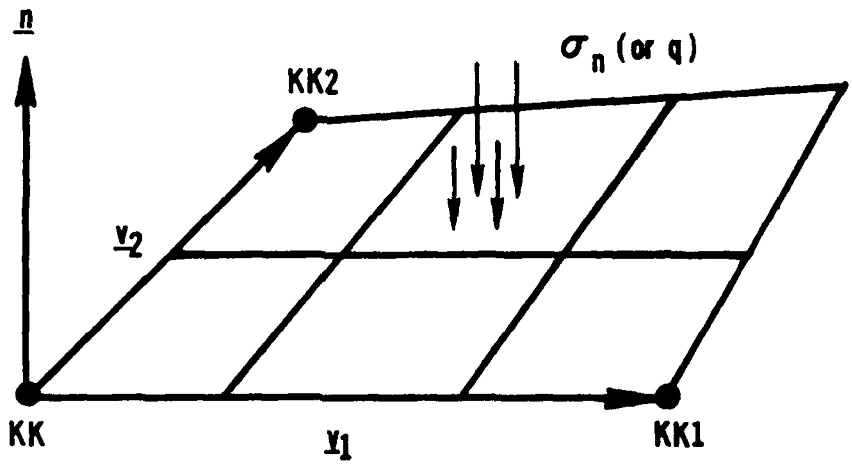

Figure 9. Pressure/Flux Sign Convention

REFERENCES

1. Herrmann, L.R. and K.D. Mish, "Finite Element Analysis for Cohesive Soil, Stress and Consolidation Problems Using Bounding Surface Plasticity Theory," Department of Civil Engineering, University of California, Davis. Report to: Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, California, Order No. N62583-83-M-T062, September 1983.

2. Zienkiewicz, O.C., The Finite Element Method, McGraw-Hill, Ltd., London, 1979.

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4. Herrmann, L.R., J.S. DeNatale and Y.F. Dafalias, "Numerical Implementation of the Cohesive Soil Bounding Surface Plasticity Model (Volume I)," Civil Engineering Laboratory, Naval Construction Battalion Center, Report CR 83.010, February 1983.

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6. Naylor, D.J. and H. Richards, "Slipping Strip Analysis of Reinforced Earth," Inter. J. for Num. Anal. Meth. in Geomechanics, 2, No. 4, 1978.

7. Herrmann, L.R., Y.F. Dafalias and J.S. DeNatale, "Bounding Surface Plasticity for Soil Modeling," Civil Engineering Laboratory, Naval Construction Battalion Center, Report CR 81.008, February 1981.

8. Herrmann, L.R., C.K. Shen, S. Jafroudi, J.S. DeNatale, and Y.F. Dafalias, "A Verification Study for the Bounding Surface Plasticity Model for Cohesive Soils," Department of Civil Engineering, University of California, Davis, Final Report to the Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, California, Order No. N62583-81-M-R-320, December 1981.

9. DeNatale, J.S., L.R. Herrmann, and Y.F. Dafalias, "User's Manual for MODCAL-Bounding Surface Soil Plasticity Model Calibration and Prediction Code (Volume II)," Civil Engineering Laboratory, Naval Construction Battalion Center, Report CR83.010, February 1983.

10. Herrmann, L.R., V.N. Kalakin, and Y.F. Dafalias, "Computer Implementation of the Bounding Surface Plasticity Model for Cohesive Soils," Department of Civil Engineering Report, University of California, Davis, September 1983.

11. DeNatale, J.S., "On the Calibration of Constitutive Models by Multivariate Optimization. A Case Study: The Bounding Surface Plasticity Model," Ph.D. Thesis, Department of Civil Engineering, University of California, Davis, 1983.

EXAMPLE PROBLEMS

Example 1: Initial State Specification

The following examples are intended to illustrate the use of certain of the input features of the program. The reader is referred to ref. [1] for a comparison of results to known solutions.

This example models an 8-element cube with a (generic) initial state given by $\sigma_x = \sigma_y = \sigma_z$ h = e = p_o = 1.0 + 2.0x + 3.0y + 4.0z. In figure 10, the mesh is viewed from the first octant (x,y,z > 0). The bottom surface of the cube is fixed, and all other nodes are free. Displacements (output) are not shown, since they are all zero.

Each field where a zero is intended as input contains a zero, not a blank: a blank (or several blanks) is a field delimiter in list-directed FORTRAN input.

A static (trivial in this case) analysis is performed with one time step, which is an arbitrary positive number (1.0 in this case). Since all the boundary conditions are homogenous, the history function IH = -2 is used for the specified displacements: no space is wasted by specifying zero forces on the rest of the boundary.

Nodes on edges are specified first, followed by six patch records to define the six faces of the body. Elements are generated with one element record. The maximum number of "elements" (bricks or patches) is twenty-four (surface patches), not eight (brick elements), hence NELMX = 24. This choice for NELMX is somewhat atypical, due to the coarseness of the mesh: for a more refined mesh, the number of brick elements would control the size of NELMX.

Finally, note the zeros on the record that separates the material properties block from the initial state specification block. The flag (three) is followed by enough zeros to exhaust the input list for the material properties read statement.

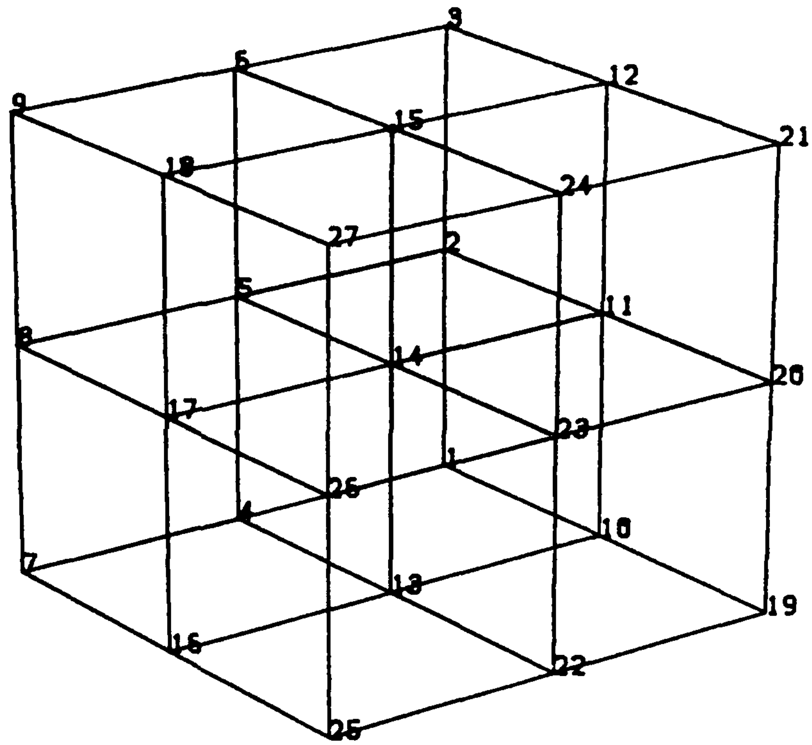

Figure 10. Mesh for Example 1

```
TEST PROBLEM TO DEMONSTRATE INITIAL STATE SPECIFICATIONS
FALSE  0.0  0  0.67  1.0  1  1  1  1  27  24  9
0.0 -3  90.0  90.0  180.0  -3
0   0   0   0   FALSE   0   0
2   0   0   0   0       0   0
0  1  1  0.0  0.0  0.0  1.0  1.0  1.0  1.0  1.0  1.0
   100.0   0.0
3  0  0  0   0   0   0   0   0   0   0   0
0 1 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0     1   0.0       0.0       0.0       0   0.0    0.0    0.0    0.0
0     3   0.0       0.0       1.0       1   0.0    0.0    0.0    0.0
0     9   1.0       0.0       1.0       3   0.0    0.0    0.0    0.0
0     7   1.0       0.0       0.0      -1   0.0    0.0    0.0    0.0
0     1   0.0       0.0       0.0      -3   0.0    0.0    0.0    0.0
0    19   0.0       1.0       0.0       9   0.0    0.0    0.0    0.0
0    21   0.0       1.0       1.0       1   0.0    0.0    0.0    0.0
0    27   1.0       1.0       1.0       3   0.0    0.0    0.0    0.0
0    25   1.0       1.0       0.0      -1   0.0    0.0    0.0    0.0
0    19   0.0       1.0       0.0      -3   0.0    0.0    0.0    0.0
0    -7   0.0       0.0       0.0       0   0.0    0.0    0.0    0.0
0   -25   0.0       0.0       0.0       9   0.0    0.0    0.0    0.0
0    -9   0.0       0.0       0.0       0   0.0    0.0    0.0    0.0
0   -27   0.0       0.0       0.0       9   0.0    0.0    0.0    0.0
0    -3   0.0       0.0       0.0       0   0.0    0.0    0.0    0.0
0   -21   0.0       0.0       0.0       9   0.0    0.0    0.0    0.0
5   0     0         0         0         0   0      0      0      0
0   1    4    5    2    1    1    1    3
0   1    2   11   10    1    1    1    9
0   1    4   13   10    1    3    1    9
0   7   16   17    8    1    1    1    9
0   3    6   15   12    1    3    1    9
0  19   22   23   20    1    1    1    3
6   0    0    0    0    0    0    0    0
0   1    2    5    4   10   11   14   13   1   1   1   1   1   3   1   9
7   0    0    0    0    0    0    0    0   0   0   0   0   0   0   0   0
0 1 7 3 19 9   -2 1 0.0   -2 1 0.0    -2 1 0.0   -2 1 0.0 0 0 0 0 0 0 0 0 0 0 0
8  0 0 0 0 0    0 0 0       0 0 0       0 0 0       0 0 0   0 0 0 0 0 0 0 0 0 0 0 0
0   1   1.0     1.0
9   0   0       0
```

Input File - Example 1

```
                      TEST PROBLEM TO DEMONSTRATE INITIAL STATE SPECIFICATIONS


*********************** MAXIMUM DIMENSION SPECIFICATIONS: ***************************

      MATMX=    1  NFUNMX=    1  IFUNSZ=    1  NCOFMX=    1  NPTMX=   27  NELMX=   24  NDSPMX=    9


********** GRID GENERATION PARAMETER =  0.000


********* THREE-DIMENSIONA! ANALYSIS ********


********** DESCRIPTION OF THE HISTORY, MAGNITUDE, AND DIRECTION OF GRAVITY: **********

      THE INITIAL MAGNITUDE OF GRAVITY:  0.000E+00        HISTORY FUNCTION:  -3
      ANGLE BETWEFN GRAVITY AND X-AXIS:  0.900E+02        HISTORY FUNCTION:  -3
      ANGLE BETWEEN GRAVITY AND Y-AXIS:  0.900E+02        HISTORY FUNCTION:  -3
      ANGLE BETWEEN GRAVITY AND Z-AXIS:  0.180E+03        HISTORY FUNCTION:  -3

******** UNSATURATED CONDITIONS


*********** LINEAR ANALYSIS **********


******* DESCRIPTION OF MATERIAL PROPERTIES:


****THE DENSITIES FOR MATERIAL NO.  1  ARE:
                              SOIL =  0.000E+00
                             FLUID =  0.000E+00
  FLUID AND PARTICLE BULK MODULUS =  0.100E+07

THE PERMEABILITY/FLUID VISCOSITY COEFFICIENTS:
  K11 =  0.100E+01          K12 =  0.100E+01          K13 =  0.100E+01
                            K22 =  0.100E+01          K23 =  0.100E+01
                                                      K33 =  0.100E+01

THE MATERIAL IS ISOTROPIC WITH E = 0.100E+03    AND POISSONS RATIO =  0.00
```

*****GEOMETRY*****

NODE POINT	X-Y-Z COORDINATES		
1	0.000E+00	0.000E+00	0.000E+00
2	0.000E+00	0.000E+00	5.000E-01
3	0.000E+00	0.000E+00	1.000E+00
4	5.000E-01	0.000E+00	0.000E+00
5	5.000E-01	0.000E+00	5.000E-01
6	5.000E-01	0.000E+00	1.000E+00
7	1.000E+00	0.000E+00	0.000E+00
8	1.000E+00	0.000E+00	5.000E-01
9	1.000E+00	0.000E+00	1.000E+00
10	0.000E+00	5.000E-01	0.000E+00
11	0.000E+00	5.000E-01	5.000E-01
12	0.000E+00	5.000E-01	1.000E+00
13	5.000E-01	5.000E-01	0.000E+00
14	5.000E-01	5.000E-01	5.000E-01
15	5.000E-01	5.000E-01	1.000E+00
16	1.000E+00	5.000E-01	0.000E+00
17	1.000E+00	5.000E-01	5.000E-01
18	1.000E+00	5.000E-01	1.000E+00
19	0.000E+00	1.000E+00	0.000E+00
20	0.000E+00	1.000E+00	5.000E-01
21	0.000E+00	1.000E+00	1.000E+00
22	5.000E-01	1.000E+00	0.000E+00
23	5.000E-01	1.000E+00	5.000E-01
24	5.000E-01	1.000E+00	1.000E+00
25	1.000E+00	1.000E+00	0.000E+00
26	1.000E+00	1.000E+00	5.000E-01
27	1.000E+00	1.000E+00	1.000E+00

******** ELEMENT INFORMATION ********

ELEMENT	MATERIAL	INITIAL STATE	NODE NUMBERS							
1	1	1	1	2	5	4	10	11	14	13
2	1	1	10	11	14	13	19	20	23	22
3	1	1	4	5	8	7	13	14	17	16
4	1	1	13	14	17	16	22	23	26	25
5	1	1	2	3	6	5	11	12	15	14
6	1	1	11	12	15	14	20	21	24	23
7	1	1	5	6	9	8	14	15	18	17
8	1	1	14	15	18	17	23	24	27	26

```
****** ELEMENT INITIALIZATIONS ******

ELEMENT          X-Y-Z COORDS OF CENTROID             SIGX         SIGY         SIGZ          H          PRECON P       VOID

   1      0.250E+00   0.250E+00   0.250E+00   0.325E+01   0.325E+01   0.325E+01   0.000E+00   0.325E+01   0.325E+01
   2      0.250E+00   0.750E+00   0.250E+00   0.475E+01   0.475E+01   0.475E+01   0.000E+00   0.475E+01   0.475E+01
   3      0.750E+00   0.250E+00   0.250E+00   0.425E+01   0.425E+01   0.425E+01   0.000E+00   0.425E+01   0.425E+01
   4      0.750E+00   0.750E+00   0.250E+00   0.575E+01   0.575E+01   0.575E+01   0.000E+00   0.575E+01   0.575E+01
   5      0.250E+00   0.250E+00   0.750E+00   0.525E+01   0.525E+01   0.525E+01   0.000E+00   0.525E+01   0.525E+01
   6      0.250E+00   0.750E+00   0.750E+00   0.675E+01   0.675E+01   0.675E+01   0.000E+00   0.675E+01   0.675E+01
   7      0.750E+00   0.250E+00   0.750E+00   0.625E+01   0.625E+01   0.625E+01   0.000E+00   0.625E+01   0.625E+01
   8      0.750E+00   0.750E+00   0.750E+00   0.775E+01   0.775E+01   0.775E+01   0.000E+00   0.775E+01   0.775E+01

********* BOUNDARY CONDITIONS ***********

NODE    1     UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      UZ = 0.000E+00  IH=-2
NODE   10     UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      UZ = 0.000E+00  IH=-2
NODE   19     UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      UZ = 0.000E+00  IH=-2
NODE    4     UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      UZ = 0.000E+00  IH=-2
NODE   13     UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      UZ = 0.000E+00  IH=-2
NODE   22     UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      UZ = 0.000E+00  IH=-2
NODE    7     UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      UZ = 0.000E+00  IH=-2
NODE   16     UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      UZ = 0.000E+00  IH=-2
NODE   25     UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      UZ = 0.000E+00  IH=-2

AT TIME   1.000E+00  NO ITERATION WAS REQUIRED
**** ELEMENT STRAINS, STRESSES, AND PRESSURES ****

ELEMENT NUMBER    1       H= 0.000E+00
     EPSX= 0.000E+00   EPSY= 0.000E+00   EPSZ= 0.000E+00   GAMXY= 0.000E+00   GAMYZ= 0.000E+00   GAMXZ= 0.000E+00
     SIGX= 0.325E+01   SIGY= 0.325E+01   SIGZ= 0.325E+01   TAUXY= 0.000E+00   TAUYZ= 0.000E+00   TAUXZ= 0.000E+00

ELEMENT NUMBER    2       H= 0.000E+00
     EPSX= 0.000E+00   EPSY= 0.000E+00   EPSZ= 0.000E+00   GAMXY= 0.000E+00   GAMYZ= 0.000E+00   GAMXZ= 0.000E+00
     SIGX= 0.475E+01   SIGY= 0.475E+01   SIGZ= 0.475E+01   TAUXY= 0.000E+00   TAUYZ= 0.000E+00   TAUXZ= 0.000E+00

ELEMENT NUMBER    3       H= 0.000E+00
     EPSX= 0.000E+00   EPSY= 0.000E+00   EPSZ= 0.000E+00   GAMXY= 0.000E+00   GAMYZ= 0.000E+00   GAMXZ= 0.000E+00
     SIGX= 0.425E+01   SIGY= 0.425E+01   SIGZ= 0.425E+01   TAUXY= 0.000E+00   TAUYZ= 0.000E+00   TAUXZ= 0.000E+00

ELEMENT NUMBER    4       H= 0.000E+00
     EPSX= 0.000E+00   EPSY= 0.000E+00   EPSZ= 0.000E+00   GAMXY= 0.000E+00   GAMYZ= 0.000E+00   GAMXZ= 0.000E+00
     SIGX= 0.575E+01   SIGY= 0.575E+01   SIGZ= 0.575E+01   TAUXY= 0.000E+00   TAUYZ= 0.000E+00   TAUXZ= 0.000E+00

ELEMENT NUMBER    5       H= 0.000E+00
     EPSX= 0.000E+00   EPSY= 0.000E+00   EPSZ= 0.000E+00   GAMXY= 0.000E+00   GAMYZ= 0.000E+00   GAMXZ= 0.000E+00
     SIGX= 0.525E+01   SIGY= 0.525E+01   SIGZ= 0.525E+01   TAUXY= 0.000E+00   TAUYZ= 0.000E+00   TAUXZ= 0.000E+00

ELEMENT NUMBER    6       H= 0.000E+00
```

```
     EPSX= 0.000E+00     EPSY= 0.000E+00     EPSZ= 0.000E+00     GAMXY= 0.000E+00     GAMYZ= 0.000E+00     GAMXZ= 0.000E+00
     SIGX= 0.675E+01     SIGY= 0.675E+01     SIGZ= 0.675E+01     TAUXY= 0.000E+00     TAUYZ= 0.000E+00     TAUXZ= 0.000E+00

ELEMENT NUMBER     7        H= 0.000E+00
     EPSX= 0.000E+00     EPSY= 0.000E+00     EPSZ= 0.000E+00     GAMXY= 0.000E+00     GAMYZ= 0.000E+00     GAMXZ= 0.000E+00
     SIGX= 0.625E+01     SIGY= 0.625E+01     SIGZ= 0.625E+01     TAUXY= 0.000E+00     TAUYZ= 0.000E+00     TAUXZ= 0.000E+00

ELEMENT NUMBER     8        H= 0.000E+00
     EPSX= 0.000E+00     EPSY= 0.000E+00     EPSZ= 0.000E+00     GAMXY= 0.000E+00     GAMYZ= 0.000E+00     GAMXZ= 0.000E+00
     SIGX= 0.775E+01     SIGY= 0.775E+01     SIGZ= 0.775E+01     TAUXY= 0.000E+00     TAUYZ= 0.000E+00     TAUXZ= 0.000E+00
```

****** NODAL DISPLACEMENTS ******

NODE	U	V	W
1	0.000E+00	0.000E+00	0.000E+00
2	0.000E+00	0.000E+00	0.000E+00
3	0.000E+00	0.000E+00	0.000E+00
4	0.000E+00	0.000E+00	0.000E+00
5	0.000E+00	0.000E+00	0.000E+00
6	0.000E+00	0.000E+00	0.000E+00
7	0.000E+00	0.000E+00	0.000E+00
8	0.000E+00	0.000E+00	0.000E+00
9	0.000E+00	0.000E+00	0.000E+00
10	0.000E+00	0.000E+00	0.000E+00
11	0.000E+00	0.000E+00	0.000E+00
12	0.000E+00	0.000E+00	0.000E+00
13	0.000E+00	0.000E+00	0.000E+00
14	0.000E+00	0.000E+00	0.000E+00
15	0.000E+00	0.000E+00	0.000E+00
16	0.000E+00	0.000E+00	0.000E+00
17	0.000E+00	0.000E+00	0.000E+00
18	0.000E+00	0.000E+00	0.000E+00
19	0.000E+00	0.000E+00	0.000E+00
20	0.000E+00	0.000E+00	0.000E+00
21	0.000E+00	0.000E+00	0.000E+00
22	0.000E+00	0.000E+00	0.000E+00
23	0.000E+00	0.000E+00	0.000E+00
24	0.000E+00	0.000E+00	0.000E+00
25	0.000E+00	0.000E+00	0.000E+00
26	0.000E+00	0.000E+00	0.000E+00
27	0.000E+00	0.000E+00	0.000E+00

Example 2: Tunnel Section Mesh Generation

This example models a section of a solid with a hole (tunnel) in it. The numbering of one layer of elements is shown in figure 11, and the whole mesh is viewed in figure 12.

The surfaces that enclose the mesh include the hole, so the last four patch records define the hole's surface.

IQUIT = TRUE on the second record, so only the geometric (as opposed to structural) analysis is performed. This is always a good idea for the first run of a problem, especially when (as in this case) the mesh is complicated.

Note the error message from the program (excessive bandwidth) on the last output page. The dimensions of the program as distributed are adequate for testing purposes, but should be increased when the user has gained enough experience to model large problems.

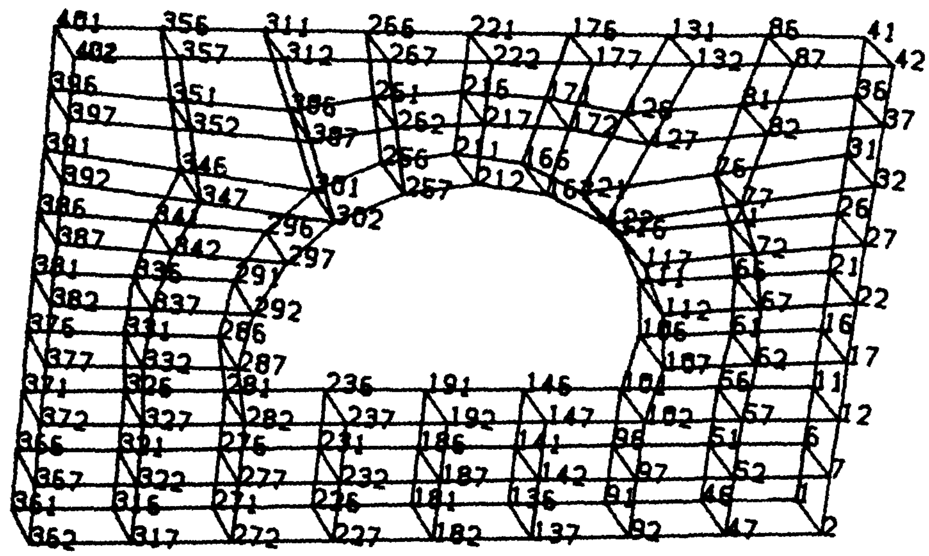

Figure 11. Numbering in one layer of elements for Example 2

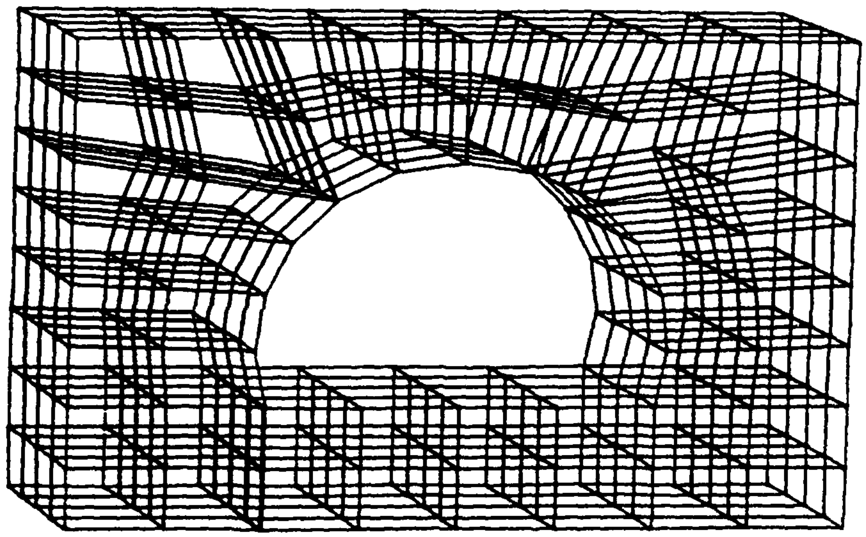

Figure 12. Mesh for Example 2

```
TEST PROBLEM TO DEMONSTRATE MESH GENERATION  (TUNNEL)
TRUE  0.0  0  0.67  1.0  1  1  1  1  405  325  1
0.0 -3  90.0  90.0  180.0  -3
0   0   0   0    FALSE    0   0
2   0   0   0    0        0   0
0  1  1  0.0  0.0  0.0  1.0  1.0  1.0  1.0  1.0  1.0
  100.0   0.0
4  0  0  0     0     0     0     0     0     0     0     0
0    1   0.0       0.0       0.0        0   0.0   0.0    0.0    0.0
0  361   1.5       0.0       0.0       45   0.0   0.0    0.0    0.0
0  401   1.5       0.0       1.0        5   0.0   0.0    0.0    0.0
0   41   0.0       0.0       1.0      -45   0.0   0.0    0.0    0.0
0   -1   0.0       0.0       0.0       -5   0.0   0.0    0.0    0.0
0    5   0.0       0.6       0.0        1   0.0   0.0    0.0    0.0
0  365   1.5       0.6       0.0       45   0.0   0.0    0.0    0.0
0  405   1.5       0.6       1.0        5   0.0   0.0    0.0    0.0
0   45   0.0       0.6       1.0      -45   0.0   0.0    0.0    0.0
0   -5   0.0       0.0       0.0       -5   0.0   0.0    0.0    0.0
0  -41   0.0       0.0       0.0        0   0.0   0.0    0.0    0.0
0  -45   0.0       0.0       0.0        1   0.0   0.0    0.0    0.0
0 -401   0.0       0.0       0.0        0   0.0   0.0    0.0    0.0
0 -405   0.0       0.0       0.0        1   0.0   0.0    0.0    0.0
0 -361   0.0       0.0       0.0        0   0.0   0.0    0.0    0.0
0 -365   0.0       0.0       0.0        1   0.0   0.0    0.0    0.0
0  101   0.375     0.0       0.25       0   0.0   0.0    0.0    0.0
0  121   0.5       0.0       0.67       5   0.0   0.375  0.0    0.5
0  301   1.0       0.0       0.67      45   0.0   0.75   0.0    0.75
0  281   1.125     0.0       0.25      -5   0.0   1.125  0.0    0.50
0 -101   0.0       0.0       0.0      -45   0.0   0.0    0.0    0.0
0  105   0.375     0.6       0.25       0   0.0   0.0    0.0    0.0
0  125   0.5       0.6       0.67       5   0.0   0.375  0.6    0.5
0  305   1.0       0.6       0.67      45   0.0   0.75   0.6    0.75
0  285   1.125     0.6       0.25      -5   0.0   1.125  0.6    0.50
0 -105   0.0       0.0       0.0      -45   0.0   0.0    0.0    0.0
0 -101   0.0       0.0       0.0        0   0.0   0.0    0.0    0.0
0 -105   0.0       0.0       0.0        1   0.0   0.0    0.0    0.0
0 -121   0.0       0.0       0.0        0   0.0   0.0    0.0    0.0
0 -125   0.0       0.0       0.0        1   0.0   0.0    0.0    0.0
0 -301   0.0       0.0       0.0        0   0.0   0.0    0.0    0.0
0 -305   0.0       0.0       0.0        1   0.0   0.0    0.0    0.0
0 -281   0.0       0.0       0.0        0   0.0   0.0    0.0    0.0
0 -285   0.0       0.0       0.0        1   0.0   0.0    0.0    0.0
5   0    0         0         0          0   0     0      0      0
0    1   46   51    6   1   45    7    5
0   91  136  141   96   3   45    1    5
0  121  166  171  126   3   45    1    5
0  271  316  321  276   1   45    7    5
0    5   50   55   10   1   45    7    5
0   95  140  145  100   3   45    1    5
0  125  170  175  130   3   45    1    5
0  275  320  325  280   1   45    7    5
0    1    2    7    6   3    1    7    5
0  361  362  367  366   3    1    7    5
0    1    2   47   46   3    1    7    5
0   41   42   87   86   3    1    7   45
0  101  102  107  106   3    1    3    5
0  121  122  167  166   3    1    3   45
0  281  282  287  286   3    1    3    5
0  101  102  147  146   3    1    3   45
6    0    0    0    0   0    0    0    0
0    1   46   51    6    2   47   52    7   1  0  3  1  7  5  1  45
0   91  136  141   96   92  137  142   97   1  0  3  1  1  5  3  45
0  121  166  171  126  122  167  172  127   1  0  3  1  1  5  3  45
0  271  316  321  276  272  317  322  277   1  0  3  1  7  5  1  45
7    0    0    0    0    0    0    0    0   0  0  0  0  0  0  0  0
0 1 0 0 0 0   -2 1 0.0   -2 1 0.0   -2 1 0.0   -2 1 0.0 0 0 0 0 0 0 0 0 0 0 0
8 0 0 0 0 0    0 0 0      0 0 0      0 0 0      0 0 0   0 0 0 0 0 0 0 0 0 0 0
0    1    1.0    1.0
9    0    0      0
```

Input File - Example 2

```
                 TEST PROBLEM TO DEMONSTRATE MESH GENERATION  (TUNNEL)

************************** MAXIMUM DIMENSION SPECIFICATIONS: ***************************

        MATMX=    1  NFUNMX=    1  IFUNSZ=    1  NCOFMX=    1  NPTMX=  405  NELMX=  325  NDSPMX=    1

********** GRID GENFRATION PARAMETER =  0.000

********* THREE-DIMENSIONAL ANALYSIS ********

********** DESCRIPTION OF THE HISTORY, MAGNITUDE, AND DIRECTION OF GRAVITY: **********

        THE INITIAL MAGNITUDE OF GRAVITY:  0.000E+00         HISTORY FUNCTION:  -3
        ANGLE BETWEEN GRAVITY AND X-AXIS:  0.900E+02         HISTORY FUNCTION:  -3
        ANGLE BETWEEN GRAVITY AND Y-AXIS:  0.900E+02         HISTORY FUNCTION:  -3
        ANGLE BETWEEN GRAVITY AND Z-AXIS:  0.180E+03         HISTORY FUNCTION:  -3

******** UNSATURATED CONDITIONS

*********** LINEAR ANALYSIS **********

******* DESCRIPTION OF MATERIAL PROPERTIES:

****THE DENSITIES FOR MATERIAL NO.  1  ARE:
                                SOIL =  0.000E+00
                               FLUID =  0.000E+00
  FLUID AND PARTICLE BULK MODULUS =  0.100E+07

THE PERMEABILITY/FLUID VISCOSITY COEFFICIENTS:
  K11 =  0.100E+01          K12 =  0.100E+01          K13 =  0.100E+01
                            K22 =  0.100E+01          K23 =  0.100E+01
                                                      K33 =  0.100E+01

THE MATERIAL IS ISOTROPIC WITH E = 0.100E+03    AND POISSONS RATIO =  0.00
```

*****GEOMETRY*****

NODE POINT	X-Y-Z COORDINATES		
1	0.000E+00	0.000E+00	0.000E+00
2	0.000E+00	1.500E-01	0.000E+00
3	0.000E+00	3.000E-01	0.000E+00
4	0.000E+00	4.500E-01	0.000E+00
5	0.000E+00	6.000E-01	0.000E+00
6	0.000E+00	0.000E+00	1.250E-01
7	-9.934E-09	1.500E-01	1.250E-01
8	-4.967E-08	3.000E-01	1.250E-01
9	-3.725E-08	4.500E-01	1.250E-01
10	0.000E+00	6.000E-01	1.250E-01
11	0.000E+00	0.000E+00	2.500E-01
12	-1.956E-08	1.500E-01	2.500E-01
13	-9.313E-08	3.000E-01	2.500E-01
14	-8.382E-08	4.500E-01	2.500E-01
15	0.000E+00	6.000E-01	2.500E-01
16	0.000E+00	0.000E+00	3.750E-01
17	-1.703E-08	1.500E-01	3.750E-01
18	-1.097E-07	3.000E-01	3.750E-01
19	-9.366E-08	4.500E-01	3.750E-01
20	0.000E+00	6.000E-01	3.750E-01
21	0.000E+00	0.000E+00	5.000E-01
22	-2.276E-08	1.500E-01	5.000E-01
23	-1.100E-07	3.000E-01	5.000E-01
24	-6.827E-08	4.500E-01	5.000E-01
25	0.000E+00	6.000E-01	5.000E-01
26	0.000E+00	0.000E+00	6.250E-01
27	-2.277E-08	1.500E-01	6.250E-01
28	-7.589E-08	3.000E-01	6.250E-01
29	-2.134E-08	4.500E-01	6.250E-01
30	0.000E+00	6.000E-01	6.250E-01
31	0.000E+00	0.000E+00	7.500E-01
32	-5.123E-08	1.500E-01	7.500E-01
33	-8.348E-08	3.000E-01	7.500E-01
34	-3.415E-08	4.500E-01	7.500E-01
35	0.000E+00	6.000E-01	7.500E-01
36	0.000E+00	0.000E+00	8.750E-01
37	-6.830E-08	1.500E-01	8.750E-01
38	-9.107E-08	3.000E-01	8.750E-01
39	-4.696E-08	4.500E-01	8.750E-01
40	0.000E+00	6.000E-01	8.750E-01
41	0.000E+00	0.000E+00	1.000E+00
42	0.000E+00	1.500E-01	1.000E+00
43	0.000E+00	3.000E-01	1.000E+00
44	0.000E+00	4.500E-01	1.000E+00
45	0.000E+00	6.000E-01	1.000E+00
46	1.875E-01	0.000E+00	0.000E+00
47	1.875E-01	1.500E-01	0.000E+00
48	1.875E-01	3.000E-01	0.000E+00
49	1.875E-01	4.500E-01	0.000E+00
50	1.875E-01	6.000E-01	0.000E+00
51	1.875E-01	-2.012E-08	1.250E-01
52	1.875E-01	1.500E-01	1.250E-01
53	1.875E-01	3.000E-01	1.250E-01
54	1.875E-01	4.500E-01	1.250E-01
55	1.875E-01	6.000E-01	1.250E-01
56	1.875E-01	-6.441E-08	2.500E-01
57	1.875E-01	1.500E-01	2.500E-01

58	1.875E 01	3.000E-01	2.500E-01
59	1.875E-01	4.500E-01	2.500E-01
60	1.875E 01	6.000E-01	2.500E-01
61	1.767E-01	-1.333E-07	3.699E-01
62	1.767E 01	1.500E-01	3.699E-01
63	1.767E-01	3.000E-01	3.699E-01
64	1.767E-01	4.500E-01	3.699E-01
65	1.767E 01	6.000E-01	3.699E-01
66	1.843E-01	-1.535E-07	4.903E-01
67	1.843E-01	1.500E-01	4.903E-01
68	1.843E-01	3.000E-01	4.903E-01
69	1.843E-01	4.500E-01	4.903E-01
70	1.843E-01	6.000E-01	4.903E-01
71	2.096E-01	-1.566E-07	6.054E-01
72	2.096E-01	1.500E-01	6.054E-01
73	2.096E-01	3.000E-01	6.054E-01
74	2.096E-01	4.500E-01	6.054E-01
75	2.096E-01	6.000E-01	6.054E-01
76	2.500E-01	-1.360E-07	7.100E-01
77	2.500E-01	1.500E-01	7.100E-01
78	2.500E-01	3.000E-01	7.100E-01
79	2.500E 01	4.500E-01	7.100E-01
80	2.500E-01	6.000E-01	7.100E-01
81	2.187E-01	-1.404E-07	8.550E-01
82	2.187E-01	1.500E-01	8.550E-01
83	2.187E-01	3.000E-01	8.550E-01
84	2.187E-01	4.500E-01	8.550E-01
85	2.187E 01	6.000E-01	8.550E-01
86	1.875E-01	0.000E+00	1.000E+00
87	1.875E 01	1.500E-01	1.000E+00
88	1.875E 01	3.000E-01	1.000E+00
89	1.875E-01	4.500E-01	1.000E+00
90	1.875E-01	6.000E-01	1.000E+00
91	3.750E-01	0.000E+00	0.000E+00
92	3.750E-01	1.500E-01	-8.568E-08
93	3.750E-01	3.000E-01	-1.788E-07
94	3.750E-01	4.500E-01	-2.794E-07
95	3.750E-01	6.000E-01	0.000E+00
96	3.750E-01	4.661E-09	1.250E-01
97	3.750E-01	1.500E-01	1.250E-01
98	3.750E-01	3.000E-01	1.250E-01
99	3.750E-01	4.500E-01	1.250E-01
100	3.750E-01	6.000E-01	1.250E-01
101	3.750E-01	0.000E+00	2.500E-01
102	3.750E-01	1.500E-01	2.500E-01
103	3.750E 01	3.000E-01	2.500E-01
104	3.750E-01	4.500E-01	2.500E-01
105	3.750E 01	6.000E-01	2.500E-01
106	3.534E-01	0.000E+00	3.647E-01
107	3.534E-01	1.500E-01	3.647E-01
108	3.534E-01	3.000E-01	3.647E-01
109	3.534E-01	4.500E-01	3.647E-01
110	3.534E-01	6.000E-01	3.647E-01
111	3.686E-01	0.000E+00	4.805E-01
112	3.686E-01	1.500E-01	4.805E-01
113	3.686E-01	3.000E-01	4.805E-01
114	3.686E-01	4.500E-01	4.805E-01
115	3.686E-01	6.000E-01	4.805E-01
116	4.192E-01	0.000E+00	5.858E-01
117	4.192E-01	1.500E-01	5.858E-01
118	4.192E 01	3.000E-01	5.858E-01

119	4.192E-01	4.500E-01	5.858E-01
120	4.192E-01	6.000E-01	5.858E-01
121	5.000E-01	0.000E+00	6.700E-01
122	5.000E-01	1.500E-01	6.700E-01
123	5.000E-01	3.000E-01	6.700E-01
124	5.000E-01	4.500E-01	6.700E-01
125	5.000E-01	6.000E-01	6.700E-01
126	4.375E-01	-7.169E-08	8.350E-01
127	4.375E-01	1.500E-01	8.350E-01
128	4.375E-01	3.000E-01	8.350E-01
129	4.375E-01	4.500E-01	8.350E-01
130	4.375E-01	6.000E-01	8.350E-01
131	3.750E-01	0.000E+00	1.000E+00
132	3.750E-01	1.500E-01	1.000E+00
133	3.750E-01	3.000E-01	1.000E+00
134	3.750E-01	4.500E-01	1.000E+00
135	3.750E-01	6.000E-01	1.000E+00
136	5.625E-01	0.000E+00	0.000E+00
137	5.625E-01	1.500E-01	-6.209E-08
138	5.625E-01	3.000E-01	-2.583E-07
139	5.625E-01	4.500E-01	-3.427E-07
140	5.625E-01	6.000E-01	0.000E+00
141	5.625E-01	3.201E-09	1.250E-01
142	5.625E-01	1.500E-01	1.250E-01
143	5.625E-01	3.000E-01	1.250E-01
144	5.625E-01	4.500E-01	1.250E-01
145	5.625E-01	6.000E-01	1.250E-01
146	5.625E-01	0.000E+00	2.500E-01
147	5.625E-01	1.500E-01	2.500E-01
148	5.625E-01	3.000E-01	2.500E-01
149	5.625E-01	4.500E-01	2.500E-01
150	5.625E-01	6.000E-01	2.500E-01
151	0.000E+00	0.000E+00	0.000E+00
152	0.000E+00	0.000E+00	0.000E+00
153	0.000E+00	0.000E+00	0.000E+00
154	0.000E+00	0.000E+00	0.000E+00
155	0.000E+00	0.000E+00	0.000E+00
156	0.000E+00	0.000E+00	0.000E+00
157	0.000E+00	0.000E+00	0.000E+00
158	0.000E+00	0.000E+00	0.000E+00
159	0.000E+00	0.000E+00	0.000E+00
160	0.000E+00	0.000E+00	0.000E+00
161	0.000E+00	0.000E+00	0.000E+00
162	0.000E+00	0.000E+00	0.000E+00
163	0.000E+00	0.000E+00	0.000E+00
164	0.000E+00	0.000E+00	0.000E+00
165	0.000E+00	0.000E+00	0.000E+00
166	6.188E-01	0.000E+00	7.295E-01
167	6.188E-01	1.500E-01	7.295E-01
168	6.188E-01	3.000E-01	7.295E-01
169	6.188E-01	4.500E-01	7.295E-01
170	6.188E-01	6.000E-01	7.295E-01
171	5.906E-01	-5.940E-08	8.648E-01
172	5.906E-01	1.500E-01	8.648E-01
173	5.906E-01	3.000E-01	8.648E-01
174	5.906E-01	4.500E-01	8.648E-01
175	5.906E-01	6.000E-01	8.648E-01
176	5.625E-01	0.000E+00	1.000E+00
177	5.625E-01	1.500E-01	1.000E+00
178	5.625E-01	3.000E-01	1.000E+00
179	5.625E-01	4.500E-01	1.000E+00

180	5.625E-01	6.000E-01	1.000E+00
181	7.500E-01	0.000E+00	0.000E+00
182	7.500E-01	1.500E-01	-7.264E-08
183	7.500E-01	3.000E-01	-3.353E-07
184	7.500E-01	4.500E-01	-3.939E-07
185	7.500E-01	6.000E-01	0.000E+00
186	7.500E-01	2.732E-09	1.250E-01
187	7.500E-01	1.500E-01	1.250E-01
188	7.500E-01	3.000E-01	1.250E-01
189	7.500E-01	4.500E-01	1.250E-01
190	7.500E-01	6.000E-01	1.250E-01
191	7.500E-01	0.000E+00	2.500E-01
192	7.500E-01	1.500E-01	2.500E-01
193	7.500E-01	3.000E-01	2.500E-01
194	7.500E-01	4.500E-01	2.500E-01
195	7.500E-01	6.000E-01	2.500E-01
196	0.000E+00	0.000E+00	0.000E+00
197	0.000E+00	0.000E+00	0.000E+00
198	0.000E+00	0.000E+00	0.000E+00
199	0.000E+00	0.000E+00	0.000E+00
200	0.000E+00	0.000E+00	0.000E+00
201	0.000E+00	0.000E+00	0.000E+00
202	0.000E+00	0.000E+00	0.000E+00
203	0.000E+00	0.000E+00	0.000E+00
204	0.000E+00	0.000E+00	0.000E+00
205	0.000E+00	0.000E+00	0.000E+00
206	0.000E+00	0.000E+00	0.000E+00
207	0.000E+00	0.000E+00	0.000E+00
208	0.000E+00	0.000E+00	0.000E+00
209	0.000E+00	0.000E+00	0.000E+00
210	0.000E+00	0.000E+00	0.000E+00
211	7.500E-01	0.000E+00	7.500E-01
212	7.500E-01	1.500E-01	7.500E-01
213	7.500E-01	3.000E-01	7.500E-01
214	7.500E-01	4.500E-01	7.500E-01
215	7.500E-01	6.000E-01	7.500E-01
216	7.500E-01	-4.702E-08	8.750E-01
217	7.500E-01	1.500E-01	8.750E-01
218	7.500E-01	3.000E-01	8.750E-01
219	7.500E-01	4.500E-01	8.750E-01
220	7.500E-01	6.000E-01	8.750E-01
221	7.500E-01	0.000E+00	1.000E+00
222	7.500E-01	1.500E-01	1.000E+00
223	7.500E-01	3.000E-01	1.000E+00
224	7.500E-01	4.500E-01	1.000E+00
225	7.500E-01	6.000E-01	1.000E+00
226	9.375E-01	0.000E+00	0.000E+00
227	9.375E-01	1.500E-01	-1.550E-07
228	9.375E-01	3.000E-01	-4.013E-07
229	9.375E-01	4.500E-01	-3.755E-07
230	9.375E-01	6.000E-01	0.000E+00
231	9.375E-01	2.510E-09	1.250E-01
232	9.375E-01	1.500E-01	1.250E-01
233	9.375E-01	3.000E-01	1.250E-01
234	9.375E-01	4.500E-01	1.250E-01
235	9.375E-01	6.000E-01	1.250E-01
236	9.375E-01	0.000E+00	2.500E-01
237	9.375E-01	1.500E-01	2.500E-01
238	9.375E-01	3.000E-01	2.500E-01
239	9.375E-01	4.500E-01	2.500E-01
240	9.375E-01	6.000E-01	2.500E-01

241	0.000E+00	0.000E+00	0.000E+00
242	0.000E+00	0.000E+00	0.000E+00
243	0.000E+00	0.000E+00	0.000E+00
244	0.000E+00	0.000E+00	0.000E+00
245	0.000E+00	0.000E+00	0.000E+00
246	0.000E+00	0.000E+00	0.000E+00
247	0.000E+00	0.000E+00	0.000E+00
248	0.000E+00	0.000E+00	0.000E+00
249	0.000E+00	0.000E+00	0.000E+00
250	0.000E+00	0.000E+00	0.000E+00
251	0.000E+00	0.000E+00	0.000E+00
252	0.000E+00	0.000E+00	0.000E+00
253	0.000E+00	0.000E+00	0.000E+00
254	0.000E+00	0.000E+00	0.000E+00
255	0.000E+00	0.000E+00	0.000E+00
256	8.812E-01	0.000E+00	7.295E-01
257	8.812E-01	1.500E-01	7.295E-01
258	8.812E-01	3.000E-01	7.295E-01
259	8.812E-01	4.500E-01	7.295E-01
260	8.812E-01	6.000E-01	7.295E-01
261	9.094E-01	-3.519E-08	8.648E-01
262	9.094E-01	1.500E-01	8.648E-01
263	9.094E-01	3.000E-01	8.648E-01
264	9.094E-01	4.500E-01	8.648E-01
265	9.094E-01	6.000E-01	8.648E-01
266	9.375E-01	0.000E+00	1.000E+00
267	9.375E-01	1.500E-01	1.000E+00
268	9.375E-01	3.000E-01	1.000E+00
269	9.375E-01	4.500E-01	1.000E+00
270	9.375E-01	6.000E-01	1.000E+00
271	1.125E+00	0.000E+00	0.000E+00
272	1.125E+00	1.500E-01	-1.863E-07
273	1.125E+00	3.000E-01	-4.636E-07
274	1.125E+00	4.500E-01	-3.818E-07
275	1.125E+00	6.000E-01	0.000E+00
276	1.125E+00	1.564E-09	1.250E-01
277	1.125E+00	1.500E-01	1.250E-01
278	1.125E+00	3.000E-01	1.250E-01
279	1.125E+00	4.500E-01	1.250E-01
280	1.125E+00	6.000E-01	1.250E-01
281	1.125E+00	0.000E+00	2.500E-01
282	1.125E+00	1.500E-01	2.500E-01
283	1.125E+00	3.000E-01	2.500E-01
284	1.125E+00	4.500E-01	2.500E-01
285	1.125E+00	6.000E-01	2.500E-01
286	1.147E+00	0.000E+00	3.647E-01
287	1.147E+00	1.500E-01	3.647E-01
288	1.147E+00	3.000E-01	3.647E-01
289	1.147E+00	4.500E-01	3.647E-01
290	1.147E+00	6.000E-01	3.647E-01
291	1.131E+00	0.000E+00	4.805E-01
292	1.131E+00	1.500E-01	4.805E-01
293	1.131E+00	3.000E-01	4.805E-01
294	1.131E+00	4.500E-01	4.805E-01
295	1.131E+00	6.000E-01	4.805E-01
296	1.081E+00	0.000E+00	5.858E-01
297	1.081E+00	1.500E-01	5.858E-01
298	1.081E+00	3.000E-01	5.858E-01
299	1.081E+00	4.500E-01	5.858E-01
300	1.081E+00	6.000E-01	5.858E-01
301	1.000E+00	0.000E+00	6.700E-01

302	1.000E+00	1.500E-01	6.700E-01
303	1.000E+00	3.000E-01	6.700E-01
304	1.000E+00	4.500E-01	6.700E-01
305	1.000E+00	6.000E-01	6.700E-01
306	1.062E+00	-2.340E-08	8.350E-01
307	1.063E+00	1.500E-01	8.350E-01
308	1.063E+00	3.000E-01	8.350E-01
309	1.063E+00	4.500E-01	8.350E-01
310	1.062E+00	6.000E-01	8.350E-01
311	1.125E+00	0.000E+00	1.000E+00
312	1.125E+00	1.500E-01	1.000E+00
313	1.125E+00	3.000E-01	1.000E+00
314	1.125E+00	4.500E-01	1.000E+00
315	1.125E+00	6.000E-01	1.000E+00
316	1.313E+00	0.000E+00	0.000E+00
317	1.312E+00	1.500E-01	7.663E-08
318	1.312E+00	3.000E-01	-5.279E-07
319	1.312E+00	4.500E-01	-4.923E-07
320	1.313E+00	6.000E-01	0.000E+00
321	1.313E+00	7.527E-10	1.250E-01
322	1.312E+00	1.500E-01	1.250E-01
323	1.312E+00	3.000E-01	1.250E-01
324	1.312E+00	4.500E-01	1.250E-01
325	1.313E+00	6.000E-01	1.250E-01
326	1.313E+00	2.036E-11	2.500E-01
327	1.312E+00	1.500E-01	2.500E-01
328	1.312E+00	3.000E-01	2.500E-01
329	1.312E+00	4.500E-01	2.500E-01
330	1.313E+00	6.000E-01	2.500E-01
331	1.323E+00	3.054E-11	3.699E-01
332	1.323E+00	1.500E-01	3.699E-01
333	1.323E+00	3.000E-01	3.699E-01
334	1.323E+00	4.500E-01	3.699E-01
335	1.323E+00	6.000E-01	3.699E-01
336	1.316E+00	4.072E-11	4.903E-01
337	1.316E+00	1.500E-01	4.903E-01
338	1.316E+00	3.000E-01	4.903E-01
339	1.316E+00	4.500E-01	4.903E-01
340	1.316E+00	6.000E-01	4.903E-01
341	1.290E+00	5.090E-11	6.054E-01
342	1.290E+00	1.500E-01	6.054E-01
343	1.290E+00	3.000E-01	6.054E-01
344	1.290E+00	4.500E-01	6.054E-01
345	1.290E+00	6.000E-01	6.054E-01
346	1.250E+00	6.109E-11	7.100E-01
347	1.250E+00	1.500E-01	7.100E-01
348	1.250E+00	3.000E-01	7.100E-01
349	1.250E+00	4.500E-01	7.100E-01
350	1.250E+00	6.000E-01	7.100E-01
351	1.281E+00	-1.163E-08	8.550E-01
352	1.281E+00	1.500E-01	8.550E-01
353	1.281E+00	3.000E-01	8.550E-01
354	1.281E+00	4.500E-01	8.550E-01
355	1.281E+00	6.000E-01	8.550E-01
356	1.313E+00	0.000E+00	1.000E+00
357	1.313E+00	1.500E-01	1.000E+00
358	1.313E+00	3.000E-01	1.000E+00
359	1.313E+00	4.500E-01	1.000E+00
360	1.313E+00	6.000E-01	1.000E+00
361	1.500E+00	0.000E+00	0.000E+00
362	1.500E+00	1.500E-01	0.000E+00

363	1.500E+00	3.000E-01	0.000E+00
364	1.500E+00	4.500E-01	0.000E+00
365	1.500E+00	6.000E-01	0.000E+00
366	1.500E+00	0.000E+00	1.250E-01
367	1.500E+00	1.500E-01	1.250E-01
368	1.500E+00	3.000E-01	1.250E-01
369	1.500E+00	4.500E-01	1.250E-01
370	1.500E+00	6.000E-01	1.250E-01
371	1.500E+00	0.000E+00	2.500E-01
372	1.500E+00	1.500E-01	2.500E-01
373	1.500E+00	3.000E-01	2.500E-01
374	1.500E+00	4.500E-01	2.500E-01
375	1.500E+00	6.000E-01	2.500E-01
376	1.500E+00	0.000E+00	3.750E-01
377	1.500E+00	1.500E-01	3.750E-01
378	1.500E+00	3.000E-01	3.750E-01
379	1.500E+00	4.500E-01	3.750E-01
380	1.500E+00	6.000E-01	3.750E-01
381	1.500E+00	0.000E+00	5.000E-01
382	1.500E+00	1.500E-01	5.000E-01
383	1.500E+00	3.000E-01	5.000E-01
384	1.500E+00	4.500E-01	5.000E-01
385	1.500E+00	6.000E-01	5.000E-01
386	1.500E+00	0.000E+00	6.250E-01
387	1.500E+00	1.500E-01	6.250E-01
388	1.500E+00	3.000E-01	6.250E-01
389	1.500E+00	4.500E-01	6.250E-01
390	1.500E+00	6.000E-01	6.250E-01
391	1.500E+00	0.000E+00	7.500E-01
392	1.500E+00	1.500E-01	7.500E-01
393	1.500E+00	3.000E-01	7.500E-01
394	1.500E+00	4.500E-01	7.500E-01
395	1.500E+00	6.000E-01	7.500E-01
396	1.500E+00	0.000E+00	8.750E-01
397	1.500E+00	1.500E-01	8.750E-01
398	1.500E+00	3.000E-01	8.750E-01
399	1.500E+00	4.500E-01	8.750E-01
400	1.500E+00	6.000E-01	8.750E-01
401	1.500E+00	0.000E+00	1.000E+00
402	1.500E+00	1.500E-01	1.000E+00
403	1.500E+00	3.000E-01	1.000E+00
404	1.500E+00	4.500E-01	1.000E+00
405	1.500E+00	6.000E-01	1.000E+00

******** ELEMENT INFORMATION ********

ELEMENT	MATERIAL	INITIAL STATE	NODE NUMBERS							
1	1	0	1	46	51	6	2	47	52	7
2	1	0	46	91	96	51	47	92	97	52
3	1	0	6	51	56	11	7	52	57	12
4	1	0	51	96	101	56	52	97	102	57
5	1	0	11	56	61	16	12	57	62	17
6	1	0	56	101	106	61	57	102	107	62
7	1	0	16	61	66	21	17	62	67	22
8	1	0	61	106	111	66	62	107	112	67
9	1	0	21	66	71	26	22	67	72	27
10	1	0	66	111	116	71	67	112	117	72
11	1	0	26	71	76	31	27	72	77	32
12	1	0	71	116	121	76	72	117	122	77
13	1	0	31	76	81	36	32	77	82	37
14	1	0	76	121	126	81	77	122	127	82
15	1	0	36	81	86	41	37	82	87	42
16	1	0	81	126	131	86	82	127	132	87
17	1	0	2	47	52	7	3	48	53	8
18	1	0	47	92	97	52	48	93	98	53
19	1	0	7	52	57	12	8	53	58	13
20	1	0	52	97	102	57	53	98	103	58
21	1	0	12	57	62	17	13	58	63	18
22	1	0	57	102	107	62	58	103	108	63
23	1	0	17	62	67	22	18	63	68	23
24	1	0	62	107	112	67	63	108	113	68
25	1	0	22	67	72	27	23	68	73	28
26	1	0	67	112	117	72	68	113	118	73
27	1	0	27	72	77	32	28	73	78	33
28	1	0	72	117	122	77	73	118	123	78
29	1	0	32	77	82	37	33	78	83	38
30	1	0	77	122	127	82	78	123	128	83
31	1	0	37	82	87	42	38	83	88	43
32	1	0	82	127	132	87	83	128	133	88
33	1	0	3	48	53	8	4	49	54	9
34	1	0	48	93	98	53	49	94	99	54
35	1	0	8	53	58	13	9	54	59	14
36	1	0	53	98	103	58	54	99	104	59
37	1	0	13	58	63	18	14	59	64	19
38	1	0	58	103	108	63	59	104	109	64
39	1	0	18	63	68	23	19	64	69	24
40	1	0	63	108	113	68	64	109	114	69
41	1	0	23	68	73	28	24	69	74	29
42	1	0	68	113	118	73	69	114	119	74
43	1	0	28	73	78	33	29	74	79	34
44	1	0	73	118	123	78	74	119	124	79
45	1	0	33	78	83	38	34	79	84	39
46	1	0	78	123	128	83	79	124	129	84
47	1	0	38	83	88	43	39	84	89	44
48	1	0	83	128	133	88	84	129	134	89
49	1	0	4	49	54	9	5	50	55	10
50	1	0	49	94	99	54	50	95	100	55

51	1	0	9	54	59	14	10	55	60	15
52	1	0	54	99	104	59	55	100	105	60
53	1	0	14	59	64	19	15	60	65	20
54	1	0	59	104	109	64	60	105	110	65
55	1	0	19	64	69	24	20	65	70	25
56	1	0	64	109	114	69	65	110	115	70
57	1	0	24	69	74	29	25	70	75	30
58	1	0	69	114	119	74	70	115	120	75
59	1	0	29	74	79	34	30	75	80	35
60	1	0	74	119	124	79	75	120	125	80
61	1	0	34	79	84	39	35	80	85	40
62	1	0	79	124	129	84	80	125	130	85
63	1	0	39	84	89	44	40	85	90	45
64	1	0	84	129	134	89	85	130	135	90
65	1	0	91	136	141	96	92	137	142	97
66	1	0	136	181	186	141	137	182	187	142
67	1	0	181	226	231	186	182	227	232	187
68	1	0	226	271	276	231	227	272	277	232
69	1	0	96	141	146	101	97	142	147	102
70	1	0	141	186	191	146	142	187	192	147
71	1	0	186	231	236	191	187	232	237	192
72	1	0	231	276	281	236	232	277	282	237
73	1	0	92	137	142	97	93	138	143	98
74	1	0	137	182	187	142	138	183	188	143
75	1	0	182	227	232	187	183	228	233	188
76	1	0	227	272	277	232	228	273	278	233
77	1	0	97	142	147	102	98	143	148	103
78	1	0	142	187	192	147	143	188	193	148
79	1	0	187	232	237	192	188	233	238	193
80	1	0	232	277	282	237	233	278	283	238
81	1	0	93	138	143	98	94	139	144	99
82	1	0	138	183	188	143	139	184	189	144
83	1	0	183	228	233	188	184	229	234	189
84	1	0	228	273	278	233	229	274	279	234
85	1	0	98	143	148	103	99	144	149	104
86	1	0	143	188	193	148	144	189	194	149
87	1	0	188	233	238	193	189	234	239	194
88	1	0	233	278	283	238	234	279	284	239
89	1	0	94	139	144	99	95	140	145	100
90	1	0	139	184	189	144	140	185	190	145
91	1	0	184	229	234	189	185	230	235	190
92	1	0	229	274	279	234	230	275	280	235
93	1	0	99	144	149	104	100	145	150	105
94	1	0	144	189	194	149	145	190	195	150
95	1	0	189	234	239	194	190	235	240	195
96	1	0	234	279	284	239	235	280	285	240
97	1	0	121	166	171	126	122	167	172	127
98	1	0	166	211	216	171	167	212	217	172
99	1	0	211	256	261	216	212	257	262	217
100	1	0	256	301	306	261	257	302	307	262
101	1	0	126	171	176	131	127	172	177	132
102	1	0	171	216	221	176	172	217	222	177
103	1	0	216	261	266	221	217	262	267	222
104	1	0	261	306	311	266	262	307	312	267
105	1	0	122	167	172	127	123	168	173	128
106	1	0	167	212	217	172	168	213	218	173
107	1	0	212	257	262	217	213	258	263	218
108	1	0	257	302	307	262	258	303	308	263
109	1	0	127	172	177	132	128	173	178	133
110	1	0	172	217	222	177	173	218	223	178
111	1	0	217	262	267	222	218	263	268	223

112	1	0	262	307	312	267	263	308	313	268
113	1	0	123	168	173	128	124	169	174	129
114	1	0	168	213	218	173	169	214	219	174
115	1	0	213	258	263	218	214	259	264	219
116	1	0	258	303	308	263	259	304	309	264
117	1	0	128	173	178	133	129	174	179	134
118	1	0	173	218	223	178	174	219	224	179
119	1	0	218	263	268	223	219	264	269	224
120	1	0	263	308	313	268	264	309	314	269
121	1	0	124	169	174	129	125	170	175	130
122	1	0	169	214	219	174	170	215	220	175
123	1	0	214	259	264	219	215	260	265	220
124	1	0	259	304	309	264	260	305	310	265
125	1	0	129	174	179	134	130	175	180	135
126	1	0	174	219	224	179	175	220	225	180
127	1	0	219	264	269	224	220	265	270	225
128	1	0	264	309	314	269	265	310	315	270
129	1	0	271	316	321	276	272	317	322	277
130	1	0	316	361	366	321	317	362	367	322
131	1	0	276	321	326	281	277	322	327	282
132	1	0	321	366	371	326	322	367	372	327
133	1	0	281	326	331	286	282	327	332	287
134	1	0	326	371	376	331	327	372	377	332
135	1	0	286	331	336	291	287	332	337	292
136	1	0	331	376	381	336	332	377	382	337
137	1	0	291	336	341	296	292	337	342	297
138	1	0	336	381	386	341	337	382	387	342
139	1	0	296	341	346	301	297	342	347	302
140	1	0	341	386	391	346	342	387	392	347
141	1	0	301	346	351	306	302	347	352	307
142	1	0	346	391	396	351	347	392	397	352
143	1	0	306	351	356	311	307	352	357	312
144	1	0	351	396	401	356	352	397	402	357
145	1	0	272	317	322	277	273	318	323	278
146	1	0	317	362	367	322	318	363	368	323
147	1	0	277	322	327	282	278	323	328	283
148	1	0	322	367	372	327	323	368	373	328
149	1	0	282	327	332	287	283	328	333	288
150	1	0	327	372	377	332	328	373	378	333
151	1	0	287	332	337	292	288	333	338	293
152	1	0	332	377	382	337	333	378	383	338
153	1	0	292	337	342	297	293	338	343	298
154	1	0	337	382	387	342	338	383	388	343
155	1	0	297	342	347	302	298	343	348	303
156	1	0	342	387	392	347	343	388	393	348
157	1	0	302	347	352	307	303	348	353	3C9
158	1	0	347	392	397	352	348	393	398	353
159	1	0	307	352	357	312	308	353	358	313
160	1	0	352	397	402	357	353	398	403	358
161	1	0	273	318	323	278	274	319	324	279
162	1	0	318	363	368	323	319	364	369	324
163	1	0	278	323	328	283	279	324	329	284
164	1	0	323	368	373	328	324	369	374	329
165	1	0	283	328	333	288	284	329	334	289
166	1	0	328	373	378	333	329	374	379	334
167	1	0	288	333	338	293	289	334	339	294
168	1	0	333	378	383	338	334	379	384	339
169	1	0	293	338	343	298	294	339	344	299
170	1	0	338	383	388	343	339	384	389	344
171	1	0	298	343	348	303	299	344	349	304
172	1	0	343	388	393	348	344	389	394	349

173	1	0	303	348	353	308	304	349	354	309
174	1	0	348	393	398	353	349	394	399	354
175	1	0	308	353	358	313	309	354	359	314
176	1	0	353	398	403	358	354	399	404	359
177	1	0	274	319	324	279	275	320	325	280
178	1	0	319	364	369	324	320	365	370	325
179	1	0	279	324	329	284	280	325	330	285
180	1	0	324	369	374	329	325	370	375	330
181	1	0	284	329	334	289	285	330	335	290
182	1	0	329	374	379	334	330	375	380	335
183	1	0	289	334	339	294	290	335	340	295
184	1	0	334	379	384	339	335	380	385	340
185	1	0	294	339	344	299	295	340	345	300
186	1	0	339	384	389	344	340	385	390	345
187	1	0	299	344	349	304	300	345	350	305
188	1	0	344	389	394	349	345	390	395	350
189	1	0	304	349	354	309	305	350	355	310
190	1	0	349	394	399	354	350	395	400	355
191	1	0	309	354	359	314	310	355	360	315
192	1	0	354	399	404	359	355	400	405	360

****** ELEMENT INITIALIZATIONS ******

ELEMENT	X-Y-Z COORDS OF CENTROID			SIGX	SIGY	SIGZ	H	PRECON P	VOID
1	0.937E-01	0.750E-01	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2	0.281E+00	0.750E-01	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3	0.937E-01	0.750E-01	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
4	0.281E+00	0.750E-01	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5	0.910E-01	0.750E-01	0.311E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6	0.273E+00	0.750E-01	0.309E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
7	0.902E-01	0.750E-01	0.434E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
8	0.271E+00	0.750E-01	0.426E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
9	0.985E-01	0.750E-01	0.555E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
10	0.295E+00	0.750E-01	0.540E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
11	0.115E+00	0.750E-01	0.673E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
12	0.345E+00	0.750E-01	0.643E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
13	0.117E+00	0.750E-01	0.798E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
14	0.352E+00	0.750E-01	0.768E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
15	0.102E+00	0.750E-01	0.933E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
16	0.305E+00	0.750E-01	0.923E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
17	0.937E-01	0.225E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	0.281E+00	0.225E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	0.937E-01	0.225E+00	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	0.281E+00	0.225E+00	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	0.910E-01	0.225E+00	0.311E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	0.273E+00	0.225E+00	0.309E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	0.902E-01	0.225E+00	0.434E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	0.271E+00	0.225E+00	0.426E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	0.985E-01	0.225E+00	0.555E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
26	0.295E+00	0.225E+00	0.540E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
27	0.115E+00	0.225E+00	0.673E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
28	0.345E+00	0.225E+00	0.643E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
29	0.117E+00	0.225E+00	0.797E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
30	0.352E+00	0.225E+00	0.767E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
31	0.102E+00	0.225E+00	0.932E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
32	0.305E+00	0.225E+00	0.923E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
33	0.937E-01	0.375E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
34	0.281E+00	0.375E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
35	0.937E-01	0.375E+00	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
36	0.281E+00	0.375E+00	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
37	0.910E-01	0.375E+00	0.311E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
38	0.273E+00	0.375E+00	0.309E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
39	0.902E-01	0.375E+00	0.434E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
40	0.271E+00	0.375E+00	0.426E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
41	0.985E-01	0.375E+00	0.555E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
42	0.295E+00	0.375E+00	0.540E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
43	0.115E+00	0.375E+00	0.673E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
44	0.345E+00	0.375E+00	0.643E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
45	0.117E+00	0.375E+00	0.797E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
46	0.352E+00	0.375E+00	0.768E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
47	0.102E+00	0.375E+00	0.933E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
48	0.305E+00	0.375E+00	0.923E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
49	0.937E-01	0.525E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
50	0.281E+00	0.525E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

51	0.937E-01	0.525E+00	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
52	0.281E+00	0.525E+00	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
53	0.910E-01	0.525E+00	0.311E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
54	0.273E+00	0.525E+00	0.309E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
55	0.902E-01	0.525E+00	0.434E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
56	0.271E+00	0.525E+00	0.426E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
57	0.985E-01	0.525E+00	0.555E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
58	0.295E+00	0.525E+00	0.540E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
59	0.115E+00	0.525E+00	0.673E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
60	0.345E+00	0.525E+00	0.643E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
61	0.117E+00	0.525E+00	0.798E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
62	0.352E+00	0.525E+00	0.768E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
63	0.102E+00	0.525E+00	0.933E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
64	0.305E+00	0.525E+00	0.923E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
65	0.469E+00	0.750E-01	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
66	0.656E+00	0.750E-01	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
67	0.844E+00	0.750E-01	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
68	0.103E+01	0.750E-01	0.625E 01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
69	0.469E+00	0.750E-01	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
70	0.656E+00	0.750E-01	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
71	0.844E+00	0.750E-01	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
72	0.103E+01	0.750E-01	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
73	0.469E+00	0.225E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
74	0.656E+00	0.225E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
75	0.844E+00	0.225E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
76	0.103E+01	0.225E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
77	0.469E+00	0.225E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
78	0.656E+00	0.225E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
79	0.844E+00	0.225E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
80	0.103E+01	0.225E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
81	0.469E+00	0.375E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
82	0.656E+00	0.375E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
83	0.844E+00	0.375E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
84	0.103E+01	0.375E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
85	0.469E+00	0.375E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
86	0.656E+00	0.375E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
87	0.844E+00	0.375E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
88	0.103E+01	0.375E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
89	0.469E+00	0.525E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
90	0.656E+00	0.525E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
91	0.844E+00	0.525E+00	0.625E 01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
92	0.103E+01	0.525E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
93	0.469E+00	0.525E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
94	0.656E+00	0.525E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
95	0.844E+00	0.525E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
96	0.103E+01	0.525E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
97	0.537E+00	0.750E-01	0.775E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
98	0.677E+00	0.750E-01	0.805E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
99	0.823E+00	0.750E-01	0.805E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
100	0.963E+00	0.750E-01	0.775E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
101	0.491E+00	0.750E-01	0.925E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
102	0.663E+00	0.750E-01	0.935E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
103	0.837E+00	0.750E-01	0.935E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
104	0.101E+01	0.750E-01	0.925E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
105	0.537E+00	0.225E+00	0.775E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
106	0.677E+00	0.225E+00	0.805E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
107	0.823E+00	0.225E+00	0.805E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
108	0.963E+00	0.225E+00	0.775E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
109	0.491E+00	0.225E+00	0.925E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
110	0.663E+00	0.225E+00	0.935E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
111	0.837E+00	0.225E+00	0.935E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

112	0.101E+01	0.225E+00	0.925E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
113	0.537E+00	0.375E+00	0.775E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
114	0.677E+00	0.375E+00	0.805E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
115	0.823E+00	0.375E+00	0.805E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
116	0.963E+00	0.375E+00	0.775E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
117	0.491E+00	0.375E+00	0.925E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
118	0.663E+00	0.375E+00	0.935E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
119	0.837E+00	0.375E+00	0.935E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
120	0.101E+01	0.375E+00	0.925E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
121	0.537E+00	0.525E+00	0.775E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
122	0.677E+00	0.525E+00	0.805E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
123	0.823E+00	0.525E+00	0.805E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
124	0.963E+00	0.525E+00	0.775E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
125	0.491E+00	0.525E+00	0.925E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
126	0.663E+00	0.525E+00	0.935E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
127	0.837E+00	0.525E+00	0.935E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
128	0.101E+01	0.525E+00	0.925E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
129	0.127E+01	0.750E-01	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
130	0.141E+01	0.750E-01	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
131	0.127E+01	0.750E-01	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
132	0.141E+01	0.750E-01	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
133	0.123E+01	0.750E-01	0.309E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
134	0.141E+01	0.750E-01	0.311E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
135	0.123E+01	0.750E-01	0.426E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
136	0.141E+01	0.750E-01	0.434E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
137	0.120E+01	0.750E-01	0.540E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
138	0.140E+01	0.750E-01	0.555E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
139	0.116E+01	0.750E-01	0.643E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
140	0.139E+01	0.750E-01	0.673E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
141	0.115E+01	0.750E-01	0.768E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
142	0.138E+01	0.750E-01	0.798E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
143	0.120E+01	0.750E-01	0.923E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
144	0.140E+01	0.750E-01	0.933E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
145	0.127E+01	0.225E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
146	0.141E+01	0.225E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
147	0.127E+01	0.225E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
148	0.141E+01	0.225E+00	0.188E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
149	0.123E+01	0.225E+00	0.309E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
150	0.141E+01	0.225E+00	0.311E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
151	0.123E+01	0.225E+00	0.426E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
152	0.141E+01	0.225E+00	0.434E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
153	0.120E+01	0.225E+00	0.540E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
154	0.140E+01	0.225E+00	0.555E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
155	0.116E+01	0.225E+00	0.643E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
156	0.139E+01	0.225E+00	0.673E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
157	0.115E+01	0.225E+00	0.768E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
158	0.138E+01	0.225E+00	0.798E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
159	0.120E+01	0.225E+00	0.923E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
160	0.140E+01	0.225E+00	0.933E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
161	0.127E+01	0.375E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
162	0.141E+01	0.375E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
163	0.127E+01	0.375E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
164	0.141E+01	0.375E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
165	0.123E+01	0.375E+00	0.309E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
166	0.141E+01	0.375E+00	0.311E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
167	0.123E+01	0.375E+00	0.426E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
168	0.141E+01	0.375E+00	0.434E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
169	0.120E+01	0.375E+00	0.540E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
170	0.140E+01	0.375E+00	0.555E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
171	0.116E+01	0.375E+00	0.643E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
172	0.139E+01	0.375E+00	0.673E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

173	0.115E+01	0.375E+00	0.768E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
174	0.138E+01	0.375E+00	0.798E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
175	0.120E+01	0.375E+00	0.923E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
176	0.140E+01	0.375E+00	0.933E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
177	0.127E+01	0.525E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
178	0.141E+01	0.525E+00	0.625E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
179	0.127E+01	0.525E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
180	0.141E+01	0.525E+00	0.187E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
181	0.123E+01	0.525E+00	0.309E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
182	0.141E+01	0.525E+00	0.311E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
183	0.123E+01	0.525E+00	0.426E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
184	0.141E+01	0.525E+00	0.434E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
185	0.120E+01	0.525E+00	0.540E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
186	0.140E+01	0.525E+00	0.555E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
187	0.116E+01	0.525E+00	0.643E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
188	0.139E+01	0.525E+00	0.673E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
189	0.115E+01	0.525E+00	0.768E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
190	0.138E+01	0.525E+00	0.798E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
191	0.120E+01	0.525E+00	0.923E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
192	0.140E+01	0.525E+00	0.933E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

********* BOUNDARY CONDITIONS ***********

NODE 1 UX = 0.000E+00 IH=-2 UY = 0.000E+00 IH=-2 UZ = 0.000E+00 IH=-2

***** THE BANDWIDTH OF 156 IS TOO LARGE FOR THE DIMENSION OF --LONGEG-- *****

Example 3: Terzaghi's Soil Column

This example models a ten-element soil column with free drainage and applied load at the top (nodes 41-44) and an impervious fixed boundary at the bottom.

IFLOW = 1 in the second record, since flows are included in this problem. Relatively few time steps are modelled (five), so the calculated dissipation of pore pressure is only an approximation to Terzaghi's exact solution. Since excess pressure is modelled, the initial state specifications and the densities are all zero.

The applied load is obtained through a pressure loading of the form $\sigma_n = 10.0$. Note that σ_n acts inward, in agreement with the sign convention for the nodal force condensation option. (See Boundary Specification section.) The load is applied only in the first increment, so the corresponding history function is IH = 0. Note that the pressure is applied before the displacement specification for nodes (41-44), as mentioned in the Boundary Specification section.

No patch data is required, since the mesh is simple enough so that all exterior nodes can be defined without any surface generation.

Note that there are 44 nodes, but that NDSPMX = 48 (in the second record). This is because there are more nodal specifications than nodes, since nodes (41-44) are specified twice.

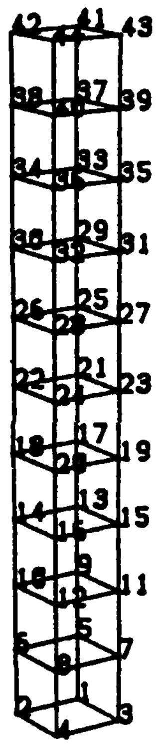

Figure 13. Mesh for Terzaghi's Problem (Example 3)

```
TERZAGHI'S PROBLEM -  10 ELEMENTS     9/23/83
FALSE  0.0  1  0.67  0.0  1  1  1  1 44  10  48
0.0 -3  90.0  90.0   180.0   -3
0   0   0   0   FALSE   0   0
2   0   0   0   0       0   0
0  1  1  0.0  0.0 1.0E6  1.0  0.0  0.0  1.0  0.0  1.0
   100.0   0.0
4  0  0  0    0   0     0    0    0    0    0    0
0    1  0.0       0.0       0.0       0  0.0    0.0    0.0    0.0
0   41  0.0       0.0      10.0       4  1.0    0.0    0.0    0.0
0    2  1.0       0.0       0.0       0  0.0    0.0    0.0    0.0
0   42  1.0       0.0      10.0       4  1.0    0.0    0.0    0.0
0    3  0.0       1.0       0.0       0  0.0    0.0    0.0    0.0
0   43  0.0       1.0      10.0       4  1.0    0.0    0.0    0.0
0    4  1.0       1.0       0.0       0  0.0    0.0    0.0    0.0
0   44  1.0       1.0      10.0       4  1.0    0.0    0.0    0.0
6    0  0         0        0          0  0      0      0      0
0   1   2   4   3   5   6   8   7   1  0  9  4  0  0  0  0
7   0   0   0   0   0   0   0   0   0  0  0  0  0  0  0  0
0 41 42 1 43 2   0 0 0.0   0 0 0.0   0 0 0.0   0 0 0.0 0 0 0 10.0 0 0 0 0 0 0
0 41 43 2 42 1 -2 1 0.0  -2 1 0.0   0 0 0.0  -2 1 0.0 0 0 0 0 0 0 0 0 0 0
0 1 3 2 2 1    -2 1 0.0  -2 1 0.0  -2 1 0.0  -2 0 0.0 0 0 0 0 0 0 0 0 0 0
0 5 6 1 37 4   -2 1 0.0  -2 1 0.0  -2 0 0.0  -2 0 0.0 0 0 0 0 0 0 0 0 0 0
0 7 8 1 39 4   -2 1 0.0  -2 1 0.0  -2 0 0.0  -2 0 0.0 0 0 0 0 0 0 0 0 0 0
8 0 0 0 0  0     0 0 0     0 0 0     0 0 0     0 0 0   0 0 0 0 0 0 0 0 0 0 0
0  5   0.1    1.0
9  0   0      0
```

Input File - Example 3

```
                    TERZAGHI'S PROBLEM -  10 ELEMENTS     9/23/83

*********************** MAXIMUM DIMENSION SPECIFICATIONS: ***************************

       MATMX=    1  NFUNMX=    1  IFUNSZ=    1  NCOFMX=    1  NPTMX=   44  NELMX=   10  NDSPMX=   48

********** GRID GENERATION PARAMETER =  0.000

********* THREE-DIMENSIONAL ANALYSIS ********

********** DESCRIPTION OF THE HISTORY, MAGNITUDE, AND DIRECTION OF GRAVITY: **********

       THE INITIAL MAGNITUDE OF GRAVITY:  0.000E+00        HISTORY FUNCTION:  -3
       ANGLE BETWEEN GRAVITY AND X-AXIS:  0.900E+02        HISTORY FUNCTION:  -3
       ANGLE BETWEEN GRAVITY AND Y-AXIS:  0.900E+02        HISTORY FUNCTION:  -3
       ANGLE BETWEEN GRAVITY AND Z-AXIS:  0.180E+03        HISTORY FUNCTION:  -3

******** SATURATED CONDITIONS-WATER MOVEMENT IS  ACCOUNTED FOR

       ---THE VALUE OF "ALPHA" USED IN INTEGRATING THE VOLUME TERM IS: 0.00
       ---THE VALUE OF "THETA" USED IN APPROXIMATING THE TIME DERIVATIVE IS: 0.67


*********** LINEAR ANALYSIS **********

******* DESCRIPTION OF MATERIAL PROPERTIES:


****THE DENSITIES FOR MATERIAL NO.  1  ARE:
                               SOIL =  0.000E+00
                              FLUID =  0.000E+00
  FLUID AND PARTICLE BULK MODULUS =  0.100E+07

THE PERMEABILITY/FLUID VISCOSITY COEFFICIENTS:
  K11 =  0.100E+01         K12 =  0.000E+00         K13 =  0.000E+00
                           K22 =  0.100E+01         K23 =  0.000E+00
                                                    K33 =  0.100E+01

THE MATERIAL IS ISOTROPIC WITH E = 0.100E+03    AND POISSONS RATIO =  0.00
```

*****GEOMETRY*****

NODE POINT	X-Y-Z COORDINATES		
1	0.000E+00	0.000E+00	0.000E+00
2	1.000E+00	0.000E+00	0.000E+00
3	0.000E+00	1.000E+00	0.000E+00
4	1.000E+00	1.000E+00	0.000E+00
5	0.000E+00	0.000E+00	1.000E+00
6	1.000E+00	0.000E+00	1.000E+00
7	0.000E+00	1.000E+00	1.000E+00
8	1.000E+00	1.000E+00	1.000E+00
9	0.000E+00	0.000E+00	2.000E+00
10	1.000E+00	0.000E+00	2.000E+00
11	0.000E+00	1.000E+00	2.000E+00
12	1.000E+00	1.000E+00	2.000E+00
13	0.000E+00	0.000E+00	3.000E+00
14	1.000E+00	0.000E+00	3.000E+00
15	0.000E+00	1.000E+00	3.000E+00
16	1.000E+00	1.000E+00	3.000E+00
17	0.000E+00	0.000E+00	4.000E+00
18	1.000E+00	0.000E+00	4.000E+00
19	0.000E+00	1.000E+00	4.000E+00
20	1.000E+00	1.000E+00	4.000E+00
21	0.000E+00	0.000E+00	5.000E+00
22	1.000E+00	0.000E+00	5.000E+00
23	0.000E+00	1.000E+00	5.000E+00
24	1.000E+00	1.000E+00	5.000E+00
25	0.000E+00	0.000E+00	6.000E+00
26	1.000E+00	0.000E+00	6.000E+00
27	0.000E+00	1.000E+00	6.000E+00
28	1.000E+00	1.000E+00	6.000E+00
29	0.000E+00	0.000E+00	7.000E+00
30	1.000E+00	0.000E+00	7.000E+00
31	0.000E+00	1.000E+00	7.000E+00
32	1.000E+00	1.000E+00	7.000E+00
33	0.000E+00	0.000E+00	8.000E+00
34	1.000E+00	0.000E+00	8.000E+00
35	0.000E+00	1.000E+00	8.000E+00
36	1.000E+00	1.000E+00	8.000E+00
37	0.000E+00	0.000E+00	9.000E+00
38	1.000E+00	0.000E+00	9.000E+00
39	0.000E+00	1.000E+00	9.000E+00
40	1.000E+00	1.000E+00	9.000E+00
41	0.000E+00	0.000E+00	1.000E+01
42	1.000E+00	0.000E+00	1.000E+01
43	0.000E+00	1.000E+00	1.000E+01
44	1.000E+00	1.000E+00	1.000E+01

******** ELEMENT INFORMATION ********

ELEMENT	MATERIAL	INITIAL STATE	NODE NUMBERS							
1	1	0	1	2	4	3	5	6	8	7
2	1	0	5	6	8	7	9	10	12	11
3	1	0	9	10	12	11	13	14	16	15
4	1	0	13	14	16	15	17	18	20	19
5	1	0	17	18	20	19	21	22	24	23
6	1	0	21	22	24	23	25	26	28	27
7	1	0	25	26	28	27	29	30	32	31
8	1	0	29	30	32	31	33	34	36	35
9	1	0	33	34	36	35	37	38	40	39
10	1	0	37	38	40	39	41	42	44	43

****** ELEMENT INITIALIZATIONS ******

ELEMENT	X-Y-Z COORDS OF CENTROID			SIGX	SIGY	SIGZ	H	PRECON P	VOID
1	0.500E+00	0.500E+00	0.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2	0.500E+00	0.500E+00	0.150E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3	0.500E+00	0.500E+00	0.250E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
4	0.500E+00	0.500E+00	0.350E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5	0.500E+00	0.500E+00	0.450E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6	0.500E+00	0.500E+00	0.550E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
7	0.500E+00	0.500E+00	0.650E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
8	0.500E+00	0.500E+00	0.750E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
9	0.500E+00	0.500E+00	0.850E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
10	0.500E+00	0.500E+00	0.950E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

********* BOUNDARY CONDITIONS ***********

NODE	41	PX = 0.000E+00	IH= 0	PY = 0.000E+00	IH= 0	PZ =-0.250E+01	IH= 0	Q = 0.000E+00	IH= 0
NODE	43	PX = 0.000E+00	IH= 0	PY = 0.000E+00	IH= 0	PZ =-0.250E+01	IH= 0	Q = 0.000E+00	IH= 0
NODE	42	PX = 0.000E+00	IH= 0	PY = 0.000E+00	IH= 0	PZ =-0.250E+01	IH= 0	Q = 0.000E+00	IH= 0
NODE	44	PX = 0.000E+00	IH= 0	PY = 0.000E+00	IH= 0	PZ =-0.250E+01	IH= 0	Q = 0.000E+00	IH= 0
NODE	41	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH= 0	H = 0.000E+00	IH=-2
NODE	42	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH= 0	H = 0.000E+00	IH=-2
NODE	43	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH= 0	H = 0.000E+00	IH=-2
NODE	44	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH= 0	H = 0.000E+00	IH=-2
NODE	1	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	UZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	2	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	UZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	3	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	UZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	4	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	UZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	5	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	9	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	13	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	17	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	21	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	25	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	29	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	33	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	37	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	6	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	10	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	14	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	18	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	22	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	26	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	30	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	34	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	38	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	7	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	11	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	15	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	19	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2
NODE	23	UX = 0.000E+00	IH=-2	UY = 0.000E+00	IH=-2	PZ = 0.000E+00	IH=-2	Q = 0.000E+00	IH=-2

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NODE    27      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    31      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    35      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    39      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE     8      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    12      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    16      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    20      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    24      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    28      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    32      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    36      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2
NODE    40      UX = 0.000E+00  IH=-2      UY = 0.000E+00  IH=-2      PZ = 0.000E+00  IH=-2      Q = 0.000E+00  IH=-2

AT TIME   2.000E-02  NO ITERATION WAS REQUIRED
**** ELEMENT STRAINS, STRESSES, AND PRESSURES ****


ELEMENT NUMBER      1        H= 0.100E+02
     EPSX= 0.750E-19    EPSY= 0.750E-19    EPSZ=-0.337E-04    GAMXY=-0.404E-26    GAMYZ=-0.457E-09    GAMXZ=-0.283E-09
     SIGX= 0.750E-17    SIGY= 0.750E-17    SIGZ=-0.337E-02    TAUXY=-0.202E-24    TAUYZ=-0.228E-07    TAUXZ=-0.141E-07

ELEMENT NUMBER      2        H= 0.999E+01
     EPSX= 0.999E-19    EPSY= 0.999E-19    EPSZ=-0.553E-04    GAMXY=-0.162E-26    GAMYZ=-0.170E-08    GAMXZ=-0.418E-09
     SIGX= 0.999E-17    SIGY= 0.999E-17    SIGZ=-0.553E-02    TAUXY=-0.808E-25    TAUYZ=-0.848E-07    TAUXZ=-0.209E-07

ELEMENT NUMBER      3        H= 0.999E+01
     EPSX= 0.999E-19    EPSY= 0.999E-19    EPSZ=-0.119E-03    GAMXY= 0.404E-26    GAMYZ=-0.349E-08    GAMXZ=-0.640E-09
     SIGX= 0.999E-17    SIGY= 0.999E-17    SIGZ=-0.119E-01    TAUXY= 0.202E-24    TAUYZ=-0.174E-06    TAUXZ=-0.320E-07

ELEMENT NUMBER      4        H= 0.997E+01
     EPSX= 0.997E-19    EPSY= 0.997E-19    EPSZ=-0.283E-03    GAMXY= 0.565E-26    GAMYZ=-0.198E-08    GAMXZ=-0.291E-09
     SIGX= 0.997E-17    SIGY= 0.997E-17    SIGZ=-0.283E-01    TAUXY= 0.283E-24    TAUYZ=-0.990E-07    TAUXZ=-0.146E-07

ELEMENT NUMBER      5        H= 0.993E+01
     EPSX= 0.991E-19    EPSY= 0.991E-19    EPSZ=-0.696E-03    GAMXY=-0.323E-26    GAMYZ=-0.108E-08    GAMXZ= 0.698E-09
     SIGX= 0.991E-17    SIGY= 0.991E-17    SIGZ=-0.696E-01    TAUXY=-0.162E-24    TAUYZ=-0.538E-07    TAUXZ= 0.349E-07

ELEMENT NUMBER      6        H= 0.983E+01
     EPSX= 0.979E-19    EPSY= 0.979E-19    EPSZ=-0.174E-02    GAMXY=-0.889E-26    GAMYZ= 0.233E-09    GAMXZ=-0.291E-09
     SIGX= 0.979E-17    SIGY= 0.979E-17    SIGZ=-0.174E+00    TAUXY=-0.444E-24    TAUYZ= 0.116E-07    TAUXZ=-0.146E-07

ELEMENT NUMBER      7        H= 0.956E+01
     EPSX= 0.946E-19    EPSY= 0.946E-19    EPSZ=-0.437E-02    GAMXY=-0.646E-26    GAMYZ= 0.314E-08    GAMXZ=-0.931E-09
     SIGX= 0.946E-17    SIGY= 0.946E-17    SIGZ=-0.437E+00    TAUXY=-0.323E-24    TAUYZ= 0.157E-06    TAUXZ=-0.466E-07

ELEMENT NUMBER      8        H= 0.890E+01
     EPSX= 0.865E-19    EPSY= 0.865E-19    EPSZ=-0.110E-01    GAMXY= 0.808E-27    GAMYZ= 0.140E-08    GAMXZ= 0.162E-26
     SIGX= 0.865E-17    SIGY= 0.865E-17    SIGZ=-0.110E+01    TAUXY= 0.404E-25    TAUYZ= 0.698E-07    TAUXZ= 0.808E-25

ELEMENT NUMBER      9        H= 0.723E+01
     EPSX= 0.659E-19    EPSY= 0.659E-19    EPSZ=-0.277E-01    GAMXY= 0.364E-26    GAMYZ=-0.186E-08    GAMXZ=-0.121E-26
     SIGX= 0.659E-17    SIGY= 0.659E-17    SIGZ=-0.277E+01    TAUXY= 0.182E-24    TAUYZ=-0.931E-07    TAUXZ=-0.606E-25

ELEMENT NUMBER     10        H= 0.302E+01
     EPSX= 0.332E-19    EPSY= 0.332E-19    EPSZ=-0.698E-01    GAMXY=-0.202E-27    GAMYZ= 0.149E-07    GAMXZ=-0.373E-08
     SIGX= 0.332E-17    SIGY= 0.332E-17    SIGZ=-0.698E+01    TAUXY=-0.101E-25    TAUYZ= 0.745E-06    TAUXZ=-0.186E-06
```

****** NODAL DISPLACEMENTS ******

NODE	U	V	W
1	-0. 250E-19	-0. 250E-19	-0. 250E-19
2	0. 250E-19	-0. 250E-19	-0. 250E-19
3	-0. 250E-19	0. 250E-19	-0. 250E-19
4	0. 250E-19	0. 250E-19	-0. 250E-19
5	-0. 500E-19	-0. 500E-19	-0. 337E-04
6	0. 500E-19	-0. 500E-19	-0. 337E-04
7	-0. 500E-19	0. 500E-19	-0. 337E-04
8	0. 500E-19	0. 500E-19	-0. 337E-04
9	-0. 500E-19	-0. 500E-19	-0. 891E-04
10	0. 500E-19	-0. 500E-19	-0. 891E-04
11	-0. 500E-19	0. 500E-19	-0. 891E-04
12	0. 500E-19	0. 500E-19	-0. 891E-04
13	-0. 499E-19	-0. 499E-19	-0. 208E-03
14	0. 499E-19	-0. 499E-19	-0. 208E-03
15	-0. 499E-19	0. 499E-19	-0. 208E-03
16	0. 499E-19	0. 499E-19	-0. 208E-03
17	-0. 498E-19	-0. 498E-19	-0. 491E-03
18	0. 498E-19	-0. 498E-19	-0. 491E-03
19	-0. 498E-19	0. 498E-19	-0. 491E-03
20	0. 498E-19	0. 498E-19	-0. 491E-03
21	-0. 494E-19	-0. 494E-19	-0. 119E-02
22	0. 494E-19	-0. 494E-19	-0. 119E-02
23	-0. 494E-19	0. 494E-19	-0. 119E-02
24	0. 494E-19	0. 494E-19	-0. 119E-02
25	-0. 485E-19	-0. 485E-19	-0. 293E-02
26	0. 485E-19	-0. 485E-19	-0. 293E-02
27	-0. 485E-19	0. 485E-19	-0. 293E-02
28	0. 485E-19	0. 485E-19	-0. 293E-02
29	-0. 462E-19	-0. 462E-19	-0. 729E-02
30	0. 462E-19	-0. 462E-19	-0. 729E-02
31	-0. 462E-19	0. 462E-19	-0. 729E-02
32	0. 462E-19	0. 462E-19	-0. 729E-02
33	-0. 403E-19	-0. 403E-19	-0. 183E-01
34	0. 403E-19	-0. 403E-19	-0. 183E-01
35	-0. 403E-19	0. 403E-19	-0. 183E-01
36	0. 403E-19	0. 403E-19	-0. 183E-01
37	-0. 256E-19	-0. 256E-19	-0. 460E-01
38	0. 256E-19	-0. 256E-19	-0. 460E-01
39	-0. 256E-19	0. 256E-19	-0. 460E-01
40	0. 256E-19	0. 256E-19	-0. 460E-01
41	-0. 754E-20	-0. 754E-20	-0. 116E+00
42	0. 754E-20	-0. 754E-20	-0. 116E+00
43	-0. 754E-20	0. 754E-20	-0. 116E+00
44	0. 754E-20	0. 754E-20	-0. 116E+00

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AT TIME    4.000E-02  NO ITERATION WAS REQUIRED
**** ELEMENT STRAINS, STRESSES, AND PRESSURES ****


ELEMENT NUMBER      1         H= 0.998E+01
     EPSX=-0.166E-21     EPSY=-0.166E-21     EPSZ=-0.214E-03     GAMXY=-0.242E-26     GAMYZ=-0.340E-09     GAMXZ= 0.474E-09
     SIGX=-0.166E-19     SIGY=-0.166E-19     SIGZ=-0.214E-01     TAUXY=-0.121E-24     TAUYZ=-0.170E-07     TAUXZ= 0.237E-07

ELEMENT NUMBER      2         H= 0.996E+01
     EPSX=-0.356E-21     EPSY=-0.356E-21     EPSZ=-0.361E-03     GAMXY= 0.969E-26     GAMYZ= 0.111E-08     GAMXZ=-0 367E-09
     SIGX=-0.356E-19     SIGY=-0.356E-19     SIGZ=-0.361E-01     TAUXY= 0.485E-24     TAUYZ= 0.553E-07     TAUXZ=-0.184E-07

ELEMENT NUMBER      3         H= 0.992E+01
     EPSX=-0.733E-21     EPSY=-0.733E-21     EPSZ=-0.752E-03     GAMXY= 0.323E-25     GAMYZ= 0.789E-09     GAMXZ=-0.437E-09
     SIGX=-0.733E-19     SIGY=-0.733E-19     SIGZ=-0.752E-01     TAUXY= 0.162E-23     TAUYZ= 0.395E-07     TAUXZ=-0.218E-07

ELEMENT NUMBER      4         H= 0.984E+01
     EPSX=-0.156E-20     EPSY=-0.156E-20     EPSZ=-0.164E-02     GAMXY= 0.226E-25     GAMYZ= 0.128E-08     GAMXZ= 0.291E-09
     SIGX=-0.156E-18     SIGY=-0.156E-18     SIGZ=-0.164E+00     TAUXY= 0.113E-23     TAUYZ= 0.640E-07     TAUXZ= 0.146E-07

ELEMENT NUMBER      5         H= 0.964E+01
     EPSX=-0.325E-20     EPSY=-0.325E-20     EPSZ=-0.357E-02     GAMXY=-0.323E-26     GAMYZ= 0.207E-08     GAMXZ= 0.175E-08
     SIGX=-0.325E-18     SIGY=-0.325E-18     SIGZ=-0.357E+00     TAUXY=-0.162E-24     TAUYZ= 0.103E-06     TAUXZ= 0.873E-07

ELEMENT NUMBER      6         H= 0.924E+01
     EPSX=-0.649E-20     EPSY=-0.649E-20     EPSZ=-0.761E-02     GAMXY=-0.113E-25     GAMYZ= 0.931E-09     GAMXZ= 0.180E-08
     SIGX=-0.649E-18     SIGY=-0.649E-18     SIGZ=-0.761E+00     TAUXY=-0.565E-24     TAUYZ= 0.466E-07     TAUXZ= 0.902E-07

ELEMENT NUMBER      7         H= 0.843E+01
     EPSX=-0.121E-19     EPSY=-0.121E-19     EPSZ=-0.157E-01     GAMXY= 0.000E+00     GAMYZ= 0.407E-08     GAMXZ=-0.419E-08
     SIGX=-0.121E-17     SIGY=-0.121E-17     SIGZ=-0.157E+01     TAUXY= 0.000E+00     TAUYZ= 0.204E-06     TAUXZ=-0.210E-06

ELEMENT NUMBER      8         H= 0.691E+01
     EPSX=-0.198E-19     EPSY=-0.198E-19     EPSZ=-0.309E-01     GAMXY= 0.162E-25     GAMYZ= 0.233E-08     GAMXZ=-0.279E-08
     SIGX=-0.198E-17     SIGY=-0.198E-17     SIGZ=-0.309E+01     TAUXY= 0.808E-24     TAUYZ= 0.116E-06     TAUXZ=-0.140E-06

ELEMENT NUMBER      9         H= 0.441E+01
     EPSX=-0.230E-19     EPSY=-0.230E-19     EPSZ=-0.559E-01     GAMXY= 0.444E-26     GAMYZ= 0.000E+00     GAMXZ= 0.186E-08
     SIGX=-0.230E-17     SIGY=-0.230E-17     SIGZ=-0.559E+01     TAUXY= 0.222E-24     TAUYZ= 0.000E+00     TAUXZ= 0.931E-07

ELEMENT NUMBER     10         H= 0.144E+01
     EPSX=-0.149E-19     EPSY=-0.149E-19     EPSZ=-0.856E-01     GAMXY=-0.565E-26     GAMYZ= 0.205E-07     GAMXZ=-0.745E-08
     SIGX=-0.149E-17     SIGY=-0.149E-17     SIGZ=-0.856E+01     TAUXY=-0.283E-24     TAUYZ= 0.102E-05     TAUXZ=-0.373E-06

         ****** NODAL DISPLACEMENTS ******

 NODE                U               V               W

   1             0.450E-22       0.450E-22      -0.646E-26
   2            -0.450E-22       0.450E-22      -0.646E-26
   3             0.450E-22      -0.450E-22      -0.969E-26
   4            -0.450E-22      -0.450E-22      -0.969E-26
   5             0.121E-21       0.121E-21      -0.214E-03
   6            -0.121E-21       0.121E-21      -0.214E-03
   7             0.121E-21      -0.121E-21      -0.214E-03
   8            -0.121E-21      -0.121E-21      -0.214E-03
```

9	0. 235E-21	0. 235E-21	-0. 574E-03
10	-0. 235E-21	0. 235E-21	-0. 574E-03
11	0. 235E-21	-0. 235E-21	-0. 574E-03
12	-0. 235E-21	-0. 235E-21	-0. 574E-03
13	0. 498E-21	0. 498E-21	-0. 133E-02
14	-0. 498E-21	0. 498E-21	-0. 133E-02
15	0. 498E-21	-0. 498E-21	-0. 133E-02
16	-0. 498E-21	-0. 498E-21	-0. 133E-02
17	0. 106E-20	0. 106E-20	-0. 297E-02
18	-0. 106E-20	0. 106E-20	-0. 297E-02
19	0. 106E-20	-0. 106E-20	-0. 297E-02
20	-0. 106E-20	-0. 106E-20	-0. 297E-02
21	0. 219E-20	0. 219E-20	-0. 654E-02
22	-0. 219E-20	0. 219E-20	-0. 654E-02
23	0. 219E-20	-0. 219E-20	-0. 654E-02
24	-0. 219E-20	-0. 219E-20	-0. 654E-02
25	0. 430E-20	0. 430E-20	-0. 142E-01
26	-0. 430E-20	0. 430E-20	-0. 142E-01
27	0. 430E-20	-0. 430E-20	-0. 142E-01
28	-0. 430E-20	-0. 430E-20	-0. 142E-01
29	0. 781E-20	0. 781E-20	-0. 299E-01
30	-0. 781E-20	0. 781E-20	-0. 299E-01
31	0. 781E-20	-0. 781E-20	-0. 299E-01
32	-0. 781E-20	-0. 781E-20	-0. 299E-01
33	0. 120E-19	0. 120E-19	-0. 608E-01
34	-0. 120E-19	0. 120E-19	-0. 608E-01
35	0. 120E-19	-0. 120E-19	-0. 608E-01
36	-0. 120E-19	-0. 120E-19	-0. 608E-01
37	0. 110E-19	0. 110E-19	-0. 117E+00
38	-0. 110E-19	0. 110E-19	-0. 117E+00
39	0. 110E-19	-0. 110E-19	-0. 117E+00
40	-0. 110E-19	-0. 110E-19	-0. 117E+00
41	0. 393E-20	0. 393E-20	-0. 202E+00
42	-0. 393E-20	0. 393E-20	-0. 202E+00
43	0. 393E-20	-0. 393E-20	-0. 202E+00
44	-0. 393E-20	-0. 393E-20	-0. 202E+00

```
AT TIME   6.000E-02  NO ITERATION WAS REQUIRED
**** ELEMENT STRAINS, STRESSES, AND PRESSURES ****


ELEMENT NUMBER      1          H= 0.992E+01
     EPSX=-0.553E-21     EPSY=-0.553E-21     EPSZ=-0.847E-03     GAMXY=-0.283E-26     GAMYZ=-0.326E-09     GAMXZ= 0.474E-09
     SIGX=-0.553E-19     SIGY=-0.553E-19     SIGZ=-0.847E-01     TAUXY=-0.141E-24     TAUYZ=-0.163E-07     TAUXZ= 0.237E-07

ELEMENT NUMBER      2          H= 0.987E+01
     EPSX=-0.105E-20     EPSY=-0.105E-20     EPSZ=-0.130E-02     GAMXY= 0.162E-26     GAMYZ= 0.114E-08     GAMXZ=-0.397E-09
     SIGX=-0.105E-18     SIGY=-0.105E-18     SIGZ=-0.130E+00     TAUXY= 0.808E-25     TAUYZ= 0.568E-07     TAUXZ=-0.198E-07

ELEMENT NUMBER      3          H= 0.976E+01
     EPSX=-0.183E-20     EPSY=-0.183E-20     EPSZ=-0.242E-02     GAMXY= 0.275E-25     GAMYZ= 0.848E-09     GAMXZ=-0.553E-09
     SIGX=-0.183E-18     SIGY=-0.183E-18     SIGZ=-0.242E+00     TAUXY= 0.137E-23     TAUYZ= 0.424E-07     TAUXZ=-0.276E-07

ELEMENT NUMBER      4          H= 0.953E+01
     EPSX=-0.324E-20     EPSY=-0.324E-20     EPSZ=-0.466E-02     GAMXY= 0.339E-25     GAMYZ= 0.151E-08     GAMXZ= 0.291E-09
     SIGX=-0.324E-18     SIGY=-0.324E-18     SIGZ=-0.466E+00     TAUXY= 0.170E-23     TAUYZ= 0.757E-07     TAUXZ= 0.146E-07

ELEMENT NUMBER      5          H= 0.912E+01
     EPSX=-0.547E-20     EPSY=-0.547E-20     EPSZ=-0.881E-02     GAMXY= 0.727E-26     GAMYZ= 0.300E-08     GAMXZ= 0.221E-08
     SIGX=-0.547E-18     SIGY=-0.547E-18     SIGZ=-0.881E+00     TAUXY= 0.364E-24     TAUYZ= 0.150E-06     TAUXZ= 0.111E-06

ELEMENT NUMBER      6          H= 0.840E+01
     EPSX=-0.843E-20     EPSY=-0.843E-20     EPSZ=-0.160E-01     GAMXY=-0.162E-25     GAMYZ= 0.373E-08     GAMXZ= 0.274E-08
     SIGX=-0.843E-18     SIGY=-0.843E-18     SIGZ=-0.160E+01     TAUXY=-0.808E-24     TAUYZ= 0.186E-06     TAUXZ= 0.137E-06

ELEMENT NUMBER      7          H= 0.725E+01
     EPSX=-0.112E-19     EPSY=-0.112E-19     EPSZ=-0.275E-01     GAMXY=-0.105E-25     GAMYZ= 0.873E-08     GAMXZ=-0.326E-08
     SIGX=-0.112E-17     SIGY=-0.112E-17     SIGZ=-0.275E+01     TAUXY=-0.525E-24     TAUYZ= 0.437E-06     TAUXZ=-0.163E-06

ELEMENT NUMBER      8          H= 0.562E+01
     EPSX=-0.114E-19     EPSY=-0.114E-19     EPSZ=-0.438E-01     GAMXY=-0.242E-26     GAMYZ= 0.605E-08     GAMXZ=-0.466E-08
     SIGX=-0.114E-17     SIGY=-0.114E-17     SIGZ=-0.438E+01     TAUXY=-0.121E-24     TAUYZ= 0.303E-06     TAUXZ=-0.233E-06

ELEMENT NUMBER      9          H= 0.362E+01
     EPSX=-0.761E-20     EPSY=-0.761E-20     EPSZ=-0.638E-01     GAMXY= 0.121E-26     GAMYZ= 0.279E-08     GAMXZ=-0.186E-08
     SIGX=-0.761E-18     SIGY=-0.761E-18     SIGZ=-0.638E+01     TAUXY= 0.606E-25     TAUYZ= 0.140E-06     TAUXZ=-0.931E-07

ELEMENT NUMBER     10          H= 0.128E+01
     EPSX=-0.281E-20     EPSY=-0.281E-20     EPSZ=-0.872E-01     GAMXY= 0.586E-26     GAMYZ= 0.251E-07     GAMXZ=-0.102E-07
     SIGX=-0.281E-18     SIGY=-0.281E-18     SIGZ=-0.872E+01     TAUXY= 0.293E-24     TAUYZ= 0.126E-05     TAUXZ=-0.512E-06

          ****** NODAL DISPLACEMENTS ******

NODE                  U                V                W

   1              0.158E-21        0.156E-21        0.000E+00
   2             -0.158E-21        0.156E-21       -0.323E-26
   3              0.158E-21       -0.156E-21       -0.162E-26
   4             -0.158E-21       -0.156E-21       -0.969E-26
   5              0.394E-21        0.394E-21       -0.847E-03
   6             -0.394E-21        0.394E-21       -0.847E-03
   7              0.394E-21       -0.394E-21       -0.847E-03
   8             -0.394E-21       -0.394E-21       -0.847E-03
```

9	0. 654E-21	0. 654E-21	-0. 215E-02
10	-0. 654E-21	0. 654E-21	-0. 215E-02
11	0. 654E-21	-0. 654E-21	-0. 215E-02
12	-0. 654E-21	-0. 654E-21	-0. 215E-02
13	0. 117E-20	0. 117E-20	-0. 458E-02
14	-0. 117E-20	0. 117E-20	-0. 458E-02
15	0. 117E-20	-0. 117E-20	-0. 458E-02
16	-0. 117E-20	-0. 117E-20	-0. 458E-02
17	0. 206E-20	0. 206E-20	-0. 924E-02
18	-0. 206E-20	0. 206E-20	-0. 924E-02
19	0. 206E-20	-0. 206E-20	-0. 924E-02
20	-0. 206E-20	-0. 206E-20	-0. 924E-02
21	0. 340E-20	0. 340E-20	-0. 180E-01
22	-0. 340E-20	0. 340E-20	-0. 180E-01
23	0. 340E-20	-0. 340E-20	-0. 180E-01
24	-0. 340E-20	-0. 340E-20	-0. 180E-01
25	0. 503E-20	0. 503E-20	-0. 340E-01
26	-0. 503E-20	0. 503E-20	-0. 340E-01
27	0. 503E-20	-0. 503E-20	-0. 340E-01
28	-0. 503E-20	-0. 503E-20	-0. 340E-01
29	0. 617E-20	0. 617E-20	-0. 615E-01
30	-0. 617E-20	0. 617E-20	-0. 615E-01
31	0. 617E-20	-0. 617E-20	-0. 615E-01
32	-0. 617E-20	-0. 617E-20	-0. 615E-01
33	0. 521E-20	0. 521E-20	-0. 105E+00
34	-0. 521E-20	0. 521E-20	-0. 105E+00
35	0. 521E-20	-0. 521E-20	-0. 105E+00
36	-0. 521E-20	-0. 521E-20	-0. 105E+00
37	0. 240E-20	0. 240E-20	-0. 169E+00
38	-0. 240E-20	0. 240E-20	-0. 169E+00
39	0. 240E-20	-0. 240E-20	-0. 169E+00
40	-0. 240E-20	-0. 240E-20	-0. 169E+00
41	0. 415E-21	0. 415E-21	-0. 256E+00
42	-0. 415E-21	0. 415E-21	-0. 256E+00
43	0. 415E-21	-0. 415E-21	-0. 256E+00
44	-0. 415E-21	-0. 415E-21	-0. 256E+00

```
AT TIME   8.000E-02  NO ITERATION WAS REQUIRED
**** ELEMENT STRAINS, STRESSES, AND PRESSURES ****

ELEMENT NUMBER     1      H= 0.978E+01
     EPSX=-0.116E-20   EPSY=-0.116E-20   EPSZ=-0.225E-02   GAMXY=-0.280E-26   GAMYZ=-0.267E-09   GAMXZ= 0.445E-09
     SIGX=-0.116E-18   SIGY=-0.116E-18   SIGZ=-0.225E+00   TAUXY=-0.140E-24   TAUYZ=-0.134E-07   TAUXZ= 0.222E-07

ELEMENT NUMBER     2      H= 0.969E+01
     EPSX=-0.196E-20   EPSY=-0.196E-20   EPSZ=-0.315E-02   GAMXY= 0.162E-26   GAMYZ= 0.114E-08   GAMXZ=-0.513E-09
     SIGX=-0.196E-18   SIGY=-0.196E-18   SIGZ=-0.315E+00   TAUXY= 0.808E-25   TAUYZ= 0.568E-07   TAUXZ=-0.256E-07

ELEMENT NUMBER     3      H= 0.948E+01
     EPSX=-0.288E-20   EPSY=-0.288E-20   EPSZ=-0.519E-02   GAMXY= 0.275E-25   GAMYZ= 0.964E-09   GAMXZ=-0.786E-09
     SIGX=-0.288E-18   SIGY=-0.288E-18   SIGZ=-0.519E+00   TAUXY= 0.138E-23   TAUYZ= 0.482E-07   TAUXZ=-0.393E-07

ELEMENT NUMBER     4      H= 0.912E+01
     EPSX=-0.425E-20   EPSY=-0.425E-20   EPSZ=-0.883E-02   GAMXY= 0.340E-25   GAMYZ= 0.221E-08   GAMXZ= 0.291E-09
     SIGX=-0.425E-18   SIGY=-0.425E-18   SIGZ=-0.883E+00   TAUXY= 0.170E-23   TAUYZ= 0.111E-06   TAUXZ= 0.146E-07

ELEMENT NUMBER     5      H= 0.853E+01
     EPSX=-0.585E-20   EPSY=-0.585E-20   EPSZ=-0.147E-01   GAMXY= 0.698E-26   GAMYZ= 0.533E-08   GAMXZ= 0.221E-08
     SIGX=-0.585E-18   SIGY=-0.585E-18   SIGZ=-0.147E+01   TAUXY= 0.349E-24   TAUYZ= 0.266E-06   TAUXZ= 0.111E-06

ELEMENT NUMBER     6      H= 0.766E+01
     EPSX=-0.719E-20   EPSY=-0.719E-20   EPSZ=-0.234E-01   GAMXY=-0.164E-25   GAMYZ= 0.559E-08   GAMXZ= 0.320E-08
     SIGX=-0.719E-18   SIGY=-0.719E-18   SIGZ=-0.234E+01   TAUXY=-0.820E-24   TAUYZ= 0.279E-06   TAUXZ= 0.160E-06

ELEMENT NUMBER     7      H= 0.646E+01
     EPSX=-0.755E-20   EPSY=-0.755E-20   EPSZ=-0.354E-01   GAMXY=-0.990E-26   GAMYZ= 0.115E-07   GAMXZ=-0.233E-08
     SIGX=-0.755E-18   SIGY=-0.755E-18   SIGZ=-0.354E+01   TAUXY=-0.495E-24   TAUYZ= 0.576E-06   TAUXZ=-0.116E-06

ELEMENT NUMBER     8      H= 0.493E+01
     EPSX=-0.673E-20   EPSY=-0.673E-20   EPSZ=-0.507E-01   GAMXY=-0.328E-26   GAMYZ= 0.107E-07   GAMXZ=-0.466E-08
     SIGX=-0.673E-18   SIGY=-0.673E-18   SIGZ=-0.507E+01   TAUXY=-0.164E-24   TAUYZ= 0.536E-06   TAUXZ=-0.233E-06

ELEMENT NUMBER     9      H= 0.309E+01
     EPSX=-0.494E-20   EPSY=-0.494E-20   EPSZ=-0.691E-01   GAMXY=-0.404E-27   GAMYZ= 0.745E-08   GAMXZ=-0.931E-09
     SIGX=-0.494E-18   SIGY=-0.494E-18   SIGZ=-0.691E+01   TAUXY=-0.202E-25   TAUYZ= 0.373E-06   TAUXZ=-0.466E-07

ELEMENT NUMBER    10      H= 0.104E+01
     EPSX=-0.250E-20   EPSY=-0.250E-20   EPSZ=-0.896E-01   GAMXY= 0.545E-26   GAMYZ= 0.242E-07   GAMXZ=-0.931E-08
     SIGX=-0.250E-18   SIGY=-0.250E-18   SIGZ=-0.896E+01   TAUXY= 0.273E-24   TAUYZ= 0.121E-05   TAUXZ=-0.466E-06

        ****** NODAL DISPLACEMENTS ******

 NODE              U               V               W

   1           0.350E-21       0.350E-21       0.171E-26
   2          -0.350E-21       0.350E-21      -0.152E-26
   3           0.350E-21      -0.350E-21       0.898E-28
   4          -0.350E-21      -0.350E-21      -0.800E-26
   5           0.810E-21       0.810E-21      -0.225E-02
   6          -0.810E-21       0.810E-21      -0.225E-02
   7           0.810E-21      -0.810E-21      -0.225E-02
   8          -0.810E-21      -0.810E-21      -0.225E-02
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9	0. 115E-20	0. 115E-20	-0. 539E-02
10	-0. 115E-20	0. 115E-20	-0. 539E-02
11	0. 115E-20	-0. 115E-20	-0. 539E-02
12	-0. 115E-20	-0. 115E-20	-0. 539E-02
13	0. 173E-20	0. 173E-20	-0. 106E-01
14	-0. 173E-20	0. 173E-20	-0. 106E-01
15	0. 173E-20	-0. 173E-20	-0. 106E-01
16	-0. 173E-20	-0. 173E-20	-0. 106E-01
17	0. 251E-20	0. 251E-20	-0. 194E-01
18	-0. 251E-20	0. 251E-20	-0. 194E-01
19	0. 251E-20	-0. 251E-20	-0. 194E-01
20	-0. 251E-20	-0. 251E-20	-0. 194E-01
21	0. 334E-20	0. 334E-20	-0. 341E-01
22	-0. 334E-20	0. 334E-20	-0. 341E-01
23	0. 334E-20	-0. 334E-20	-0. 341E-01
24	-0. 334E-20	-0. 334E-20	-0. 341E-01
25	0. 385E-20	0. 385E-20	-0. 575E-01
26	-0. 385E-20	0. 385E-20	-0. 575E-01
27	0. 385E-20	-0. 385E-20	-0. 575E-01
28	-0. 385E-20	-0. 385E-20	-0. 575E-01
29	0. 370E-20	0. 370E-20	-0. 930E-01
30	-0. 370E-20	0. 370E-20	-0. 930E-01
31	0. 370E-20	-0. 370E-20	-0. 930E-01
32	-0. 370E-20	-0. 370E-20	-0. 930E-01
33	0. 303E-20	0. 303E-20	-0. 144E+00
34	-0. 303E-20	0. 303E-20	-0. 144E+00
35	0. 303E-20	-0. 303E-20	-0. 144E+00
36	-0. 303E-20	-0. 303E-20	-0. 144E+00
37	0. 191E-20	0. 191E-20	-0. 213E+00
38	-0. 191E-20	0. 191E-20	-0. 213E+00
39	0. 191E-20	-0. 191E-20	-0. 213E+00
40	-0. 191E-20	-0. 191E-20	-0. 213E+00
41	0. 591E-21	0. 591E-21	-0. 302E+00
42	-0. 591E-21	0. 591E-21	-0. 302E+00
43	0. 591E-21	-0. 591E-21	-0. 302E+00
44	-0. 591E-21	-0. 591E-21	-0. 302E+00

```
AT TIME   1.000E-01  NO ITERATION WAS REQUIRED
**** ELEMENT STRAINS, STRESSES, AND PRESSURES ****

ELEMENT NUMBER      1         H= 0.955E+01
     EPSX=-0.179E-20    EPSY=-0.179E-20    EPSZ=-0 450E-02    GAMXY=-0.276E-26    GAMYZ=-0.151E-09    GAMXZ= 0.503E-09
     SIGX=-0.179E-18    SIGY=-0.179E-18    SIGZ=-0.450E+00    TAUXY=-0.138E-24    TAUYZ=-0.755E-08    TAUXZ= 0.251E-07

ELEMENT NUMBER      2         H= 0.942E+01
     EPSX=-0.275E-20    EPSY=-0.275E-20    EPSZ=-0.581E-02    GAMXY= 0.155E-26    GAMYZ= 0.114E-08    GAMXZ=-0.513E-09
     SIGX=-0.275E-18    SIGY=-0.275E-18    SIGZ=-0.581E+00    TAUXY= 0.773E-25    TAUYZ= 0.568E-07    TAUXZ=-0.256E-07

ELEMENT NUMBER      3         H= 0.914E+01
     EPSX=-0.348E-20    EPSY=-0.348E-20    EPSZ=-0.862E-02    GAMXY= 0.276E-25    GAMYZ= 0.964E-09    GAMXZ=-0.553E-09
     SIGX=-0.348E-18    SIGY=-0.348E-18    SIGZ=-0.862E+00    TAUXY= 0.138E-23    TAUYZ= 0.482E-07    TAUXZ=-0.276E-07

ELEMENT NUMBER      4         H= 0.868E+01
     EPSX=-0.439E-20    EPSY=-0.439E-20    EPSZ=-0.132F-01    GAMXY= 0.341E-25    GAMYZ= 0.291E-08    GAMXZ= 0.990E-09
     SIGX=-0.439E-18    SIGY=-0.439E-18    SIGZ=-0.132E+01    TAUXY= 0.170E-23    TAUYZ= 0.146E-06    TAUXZ= 0.495E-07

ELEMENT NUMBER      5         H= 0.800E+01
     EPSX=-0.523E-20    EPSY=-0.523E-20    EPSZ=-0.200E-01    GAMXY= 0.689E-26    GAMYZ= 0.626E-08    GAMXZ= 0.361E-08
     SIGX=-0.523E-18    SIGY=-0.523E-18    SIGZ=-0.200E+01    TAUXY= 0.345E-24    TAUYZ= 0.313E-06    TAUXZ= 0.180E-06

ELEMENT NUMBER      6         H= 0.707E+01
     EPSX=-0.572E-20    EPSY=-0.572E-2C    EPSZ=-0.293E-01    GAMXY=-0.165E-25    GAMYZ= 0.605E-08    GAMXZ= 0.460E-08
     SIGX=-0.572E-18    SIGY=-0.572E-18    SIGZ=-0.293E+01    TAUXY=-0.823E-24    TAUYZ= 0.303E-06    TAUXZ= 0.230E-06

ELEMENT NUMBER      7         H= 0.587E+01
     EPSX=-0.568E-20    EPSY=-0.568E-20    EPSZ=-0.413E-01    GAMXY=-0.107E-25    GAMYZ= 0.143E-07    GAMXZ=-0.186E-08
     SIGX=-0.568E-18    SIGY=-0.568E-18    SIGZ=-0.413E+01    TAUXY=-0.536E-24    TAUYZ= 0.716E-06    TAUXZ=-0.931E-07

ELEMENT NUMBER      8         H= 0.441E+01
     EPSX=-0.490E-20    EPSY=-0.490E-20    EPSZ=-0.559E-01    GAMXY=-0.409E-26    GAMYZ= 0.126E-07    GAMXZ=-0.373E-08
     SIGX=-0.490E-18    SIGY=-0.490E-18    SIGZ=-0.559E+01    TAUXY=-0.204E-24    TAUYZ= 0.629E-06    TAUXZ=-0.186E-06

ELEMENT NUMBER      9         H= 0.275E+01
     EPSX=-0.326E-20    EPSY=-0.326E-20    EPSZ=-0.725E-01    GAMXY=-0.442E-27    GAMYZ= 0.652E-08    GAMXZ= 0.931E-09
     SIGX=-0.326E-18    SIGY=-0.326E-18    SIGZ=-0.725E+01    TAUXY=-0.221E-25    TAUYZ= 0.326E-06    TAUXZ= 0.466E-07

ELEMENT NUMBER     10         H= 0.938E+00
     EPSX=-0.137E-20    EPSY=-0.137E-20    EPSZ=-0.906E-01    GAMXY= 0.565E-26    GAMYZ= 0.224E-07    GAMXZ=-0.102E-07
     SIGX=-0.137E-18    SIGY=-0.137E-18    SIGZ=-0.906E+01    TAUXY= 0.283E-24    TAUYZ= 0.112E-05    TAUXZ=-0.512E-06

          ****** NODAL DISPLACEMENTS ******

NODE              U             V             W

  1          0.563E-21     0.563E-21     0.133E-26
  2         -0.563E-21     0.563E-21    -0.191E-26
  3          0.563E-21    -0.563E-21    -0.314E-27
  4         -0.563E-21    -0.563E-21    -0.839E-26
  5          0.123E-20     0.123E-20    -0.450E-02
  6         -0.123E-20     0.123E-20    -0.450E-02
  7          0.123E-20    -0.123E-20    -0.450E-02
  8         -0.123E-20    -0.123E-20    -0.450E-02
```

9	0. 152E-20	0. 152E-20	-0. 103E-01
10	-0. 152E-20	0. 152E-20	-0. 103E-01
11	0. 152E-20	-0. 152E-20	-0. 103E-01
12	-0. 152E-20	-0. 152E-20	-0. 103E-01
13	0. 196E-20	0. 196E-20	-0. 189E-01
14	-0. 196E-20	0. 196E-20	-0. 189E-01
15	0. 196E-20	-0. 196E-20	-0. 189E-01
16	-0. 196E-20	-0. 196E-20	-0. 189E-01
17	0. 243E-20	0. 243E-20	-0. 322E-01
18	-0. 243E-20	0. 243E-20	-0. 322E-01
19	0. 243E-20	-0. 243E-20	-0. 322E-01
20	-0. 243E-20	-0. 243E-20	-0. 322E-01
21	0. 280E-20	0. 280E-20	-0. 522E-01
22	-0. 280E-20	0. 280E-20	-0. 522E-01
23	0. 280E-20	-0. 280E-20	-0. 522E-01
24	-0. 280E-20	-0. 280E-20	-0. 522E-01
25	0. 292E-20	0. 292E-20	-0. 815E-01
26	-0. 292E-20	0. 292E-20	-0. 815E-01
27	0. 292E-20	-0. 292E-20	-0. 815E-01
28	-0. 292E-20	-0. 292E-20	-0. 815E-01
29	0. 275E-20	0. 275E-20	-0. 123E+00
30	-0. 275E-20	0. 275E-20	-0. 123E+00
31	0. 275E-20	-0. 275E-20	-0. 123E+00
32	-0. 275E-20	[illegible]	-0. 123E+00
33	0. 215E-20	[illegible]	-0. 179E+00
34	-0. 215E-20	0. 215E-20	-0. 179E+00
35	0. 215E-20	-0. 215E-20	-0. 179E+00
36	-0. 213E-20	-0. 215E-20	-0. 179E+00
37	0. 111E-20	0. 111E-20	-0. 251E+00
38	-0. 111E-20	0. 111E-20	-0. 251E+00
39	0. 111E-20	-0. 111E-20	-0. 251E+00
40	-0. 111E-20	-0. 111E-20	-0. 251E+00
41	0. 260E-21	0. 260E-21	-0. 342E+00
42	-0. 260E-21	0. 260E-21	-0. 342E+00
43	0. 260E-21	-0. 260E-21	-0. 342E+00
44	-0. 260E-21	-0. 260E-21	-0. 342E+00

Example 4: Terzaghi's Problem Rotated

This final example demonstrates the use of the rotation convention for boundary conditions. The column (which lies along the z-axis in example 3) is rotated into the first quadrant, where it lies along the line x=y=z. The same pressure and fixed boundary condition specifications as those of example 3 can be used, but the specifications for the nodes along the sides of the column must be rotated. The rotations defined by θ_1 = 45.0 degrees, θ_2 = 35.3 degrees, and θ_3 arbitrary (see figure 8) are sufficient to rotate the column to the desired position, and are used to specify the mixed force-displacement condition for nodes (5-40).

Although no gravity loadings were modelled, for illustrative purposes the angle in which gravity would act was chosen to coincide with the direction of the column.

AD-A137 782 USER'S MANUAL FOR SAC-3: A THREE-DIMENSIONAL NONLINEAR TIME DEPENDENT SOI..(U) CALIFORNIA UNIV DAVIS K D MISH ET AL. DEC 83 NCEL-CR-84.009 N62583-83-M-T062 2/2

UNCLASSIFIED F/G 8/13 NL

END
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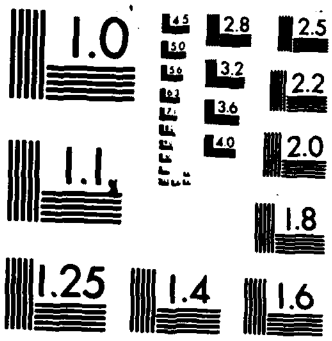

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

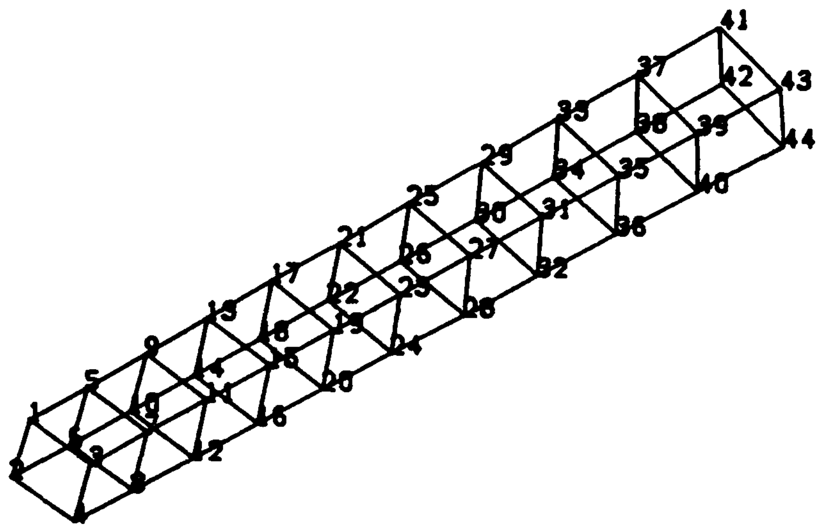

Figure 14. Mesh for Example 4

```
TERZAGHI'S PROBLEM GEOMETRY ROTATED INTO THE FIRST OCTANT
FALSE  0.0  0  0.67  1.0  1  1  1  1 44  10  48
0.0 -2  54.74  54.74  54.74 -2
0   0   0   0   FALSE   0   0
2   0   0   0   0       0   0
0  1  1  0.0  0.0 1.0E6  1.0  0.0  0.0  1.0  0.0  1.0
   100.0   0.0
4  0  0  0    0   0     0   0    0   0   0   0
0    1  0.0      0.0       0.0       0  0.0   0.0   0.0   0.0
0   41  5.7735   5.7735    5.7735    4  1.0   0.0   0.0   0.0
0    2  0.8165  -0.4082   -0.4082    0  0.0   0.0   0.0   0.0
0   42  6.5900   5.36525   5.36525   4  1.0   0.0   0.0   0.0
0    3  0.0      0.7071   -0.7071    0  0.0   0.0   0.0   0.0
0   43  5.7735   6.48061   5.0664    4  1.0   0.0   0.0   0.0
0    4  0.8165   0.2989   -1.1154    0  0.0   0.0   0.0   0.0
0   44  6.5900   6.07236   4.65815   4  1.0   0.0   0.0   0.0
6    0  0        0         0         0  0     0     0     0
0   1   2   4   3   5   6   8   7   1   0   9   4   0   0   0   0
7   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
0 41 42 1 43 2  0 0 0.0  0 0 0.0  0 0 0.0 -2 1 0.0 0 0 0 10  0 0 0 0 0 0 0
0 1 3 2 2 1    -2 1 0.0 -2 1 0.0 -2 1 0.0 -2 0 0.0 0 0 0 0 0 0 0 0 0 0 0
0 5 6 1 41 4   -2 1 0.0 -2 1 0.0 -2 0 0.0 -2 0 0.0 -45.0 35.3 0 0 0 0 0 0 0 0 0
0 7 8 1 43 4   -2 1 0.0 -2 1 0.0 -2 0 0.0 -2 0 0.0 -45.0 35.3 0 0 0 0 0 0 0 0 0
8 0 0 0 0  0    0 0 0    0 0 0    0 0 0    0 0 0   0    0    0 0 0 0 0 0 0 0 0
0  1   0.1    1.0
9  0   0      0
```

Input File - Example 4

```
TERZAGHI'S PROBLEM GEOMETRY ROTATED INTO THE FIRST OCTANT


*********************** MAXIMUM DIMENSION SPECIFICATIONS: ***************************

        MATMX=    1  NFUNMX=    1  IFUNSZ=    1  NCOFMX=    1  NPTMX=   44  NELMX=   10  NDSPMX=   48


********** GRID GENERATION PARAMETER =  0.000


********* THREE-DIMENSIONAL ANALYSIS ********


********** DESCRIPTION OF THE HISTORY, MAGNITUDE, AND DIRECTION OF GRAVITY: **********

        THE INITIAL MAGNITUDE OF GRAVITY:  0.000E+00         HISTORY FUNCTION:  -2
        ANGLE BETWEEN GRAVITY AND X-AXIS:  0.547E+02         HISTORY FUNCTION:  -2
        ANGLE BETWEEN GRAVITY AND Y-AXIS:  0.547E+02         HISTORY FUNCTION:  -2
        ANGLE BETWEEN GRAVITY AND Z-AXIS:  0.547E+02         HISTORY FUNCTION:  -2


******** UNSATURATED CONDITIONS


*********** LINEAR ANALYSIS **********


******* DESCRIPTION OF MATERIAL PROPERTIES:


****THE DENSITIES FOR MATERIAL NO.  1  ARE:
                             SOIL =  0.000E+00
                            FLUID =  0.000E+00
  FLUID AND PARTICLE BULK MODULUS =  0.100E+07

THE PERMEABILITY/FLUID VISCOSITY COEFFICIENTS:
  K11 =  0.100E+01        K12 =  0.000E+00          K13 =  0.000E+00
                          K22 =  0.100E+01          K23 =  0.000E+00
                                                    K33 =  0.100E+01

THE MATERIAL IS ISOTROPIC WITH E = 0.100E+03    AND POISSONS RATIO =  0.00
```

*****GEOMETRY*****

NODE POINT	X-Y-Z COORDINATES		
1	0.000E+00	0.000E+00	0.000E+00
2	8.165E-01	-4.082E-01	-4.082E-01
3	0.000E+00	7.071E-01	-7.071E-01
4	8.165E-01	2.989E-01	-1.115E+00
5	5.774E-01	5.774E-01	5.774E-01
6	1.394E+00	1.691E-01	1.691E-01
7	5.774E-01	1.284E+00	-1.297E-01
8	1.394E+00	8.762E-01	-5.380E-01
9	1.155E+00	1.155E+00	1.155E+00
10	1.971E+00	7.465E-01	7.465E-01
11	1.155E+00	1.862E+00	4.476E-01
12	1.971E+00	1.454E+00	3.931E-02
13	1.732E+00	1.732E+00	1.732E+00
14	2.549E+00	1.324E+00	1.324E+00
15	1.732E+00	2.439E+00	1.025E+00
16	2.549E+00	2.031E+00	6.167E-01
17	2.309E+00	2.309E+00	2.309E+00
18	3.126E+00	1.901E+00	1.901E+00
19	2.309E+00	3.017E+00	1.602E+00
20	3.126E+00	2.608E+00	1.194E+00
21	2.887E+00	2.887E+00	2.887E+00
22	3.703E+00	2.479E+00	2.479E+00
23	2.887E+00	3.594E+00	2.180E+00
24	3.703E+00	3.186E+00	1.771E+00
25	3.464E+00	3.464E+00	3.464E+00
26	4.281E+00	3.056E+00	3.056E+00
27	3.464E+00	4.171E+00	2.757E+00
28	4.281E+00	3.763E+00	2.349E+00
29	4.041E+00	4.041E+00	4.041E+00
30	4.858E+00	3.633E+00	3.633E+00
31	4.041E+00	4.749E+00	3.334E+00
32	4.858E+00	4.340E+00	2.926E+00
33	4.619E+00	4.619E+00	4.619E+00
34	5.435E+00	4.211E+00	4.211E+00
35	4.619E+00	5.326E+00	3.912E+00
36	5.435E+00	4.918E+00	3.503E+00
37	5.196E+00	5.196E+00	5.196E+00
38	6.013E+00	4.788E+00	4.788E+00
39	5.196E+00	5.903E+00	4.489E+00
40	6.013E+00	5.495E+00	4.081E+00
41	5.773E+00	5.773E+00	5.773E+00
42	6.590E+00	5.365E+00	5.365E+00
43	5.773E+00	6.481E+00	5.066E+00
44	6.590E+00	6.072E+00	4.658E+00

******** ELEMENT INFORMATION ********

ELEMENT	MATERIAL	INITIAL STATE	NODE NUMBERS							
1	1	0	1	2	4	3	5	6	8	7
2	1	0	5	6	8	7	9	10	12	11
3	1	0	9	10	12	11	13	14	16	15
4	1	0	13	14	16	15	17	18	20	19
5	1	0	17	18	20	19	21	22	24	23
6	1	0	21	22	24	23	25	26	28	27
7	1	0	25	26	28	27	29	30	32	31
8	1	0	29	30	32	31	33	34	36	35
9	1	0	33	34	36	35	37	38	40	39
10	1	0	37	38	40	39	41	42	44	43

****** ELEMENT INITIALIZATIONS ******

ELEMENT	X-Y-Z COORDS OF CENTROID			SIGX	SIGY	SIGZ	H	PRECON P	VOID
1	0.697E+00	0.438E+00	-0.269E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2	0.127E+01	0.102E+01	0.308E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3	0.185E+01	0.159E+01	0.886E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
4	0.243E+01	0.217E+01	0.146E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5	0.301E+01	0.275E+01	0.204E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6	0.358E+01	0.332E+01	0.262F+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
7	0.416E+01	0.390E+01	0.320E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
8	0.474E+01	0.448E+01	0.377E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
9	0.532E+01	0.506E+01	0.435E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
10	0.589E+01	0.563E+01	0.493E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

********* BOUNDARY CONDITIONS ***********

```
NODE  41    PX =-0.144E+01  IH= 0     PY =-0.144E+01  IH= 0     PZ =-0.144E+01  IH= 0
NODE  43    PX =-0.144E+01  IH= 0     PY =-0.144E+01  IH= 0     PZ =-0.144E+01  IH= 0
NODE  42    PX =-0.144E+01  IH= 0     PY =-0.144E+01  IH= 0     PZ =-0.144E+01  IH= 0
NODE  44    PX =-0.144E+01  IH= 0     PY =-0.144E+01  IH= 0     PZ =-0.144E+01  IH= 0
NODE   1    UX = 0.000E+00  IH=-2     UY = 0.000E+00  IH=-2     UZ = 0.000E+00  IH=-2
NODE   2    UX = 0.000E+00  IH=-2     UY = 0.000E+00  IH=-2     UZ = 0.000E+00  IH=-2
NODE   3    UX = 0.000E+00  IH=-2     UY = 0.000E+00  IH=-2     UZ = 0.000E+00  IH=-2
NODE   4    UX = 0.000E+00  IH=-2     UY = 0.000E+00  IH=-2     UZ = 0.000E+00  IH=-2
NODE   5    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE   9    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  13    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  17    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  21    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  25    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  29    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  33    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  37    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  41    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE   6    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  10    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  14    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
            TH1=-0.450E+02  DEG       TH2= 0.353E+02  DEG       TH3= 0.000E+00  DEG
NODE  18    U1 = 0.000E+00  IH=-2     U2 = 0.000E+00  IH=-2     P3 = 0.000E+00  IH=-2
```

```
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     22         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     26         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     30         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     34         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     38         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     42         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE      7         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     11         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     15         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     19         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     23         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     27         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     31         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     35         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     39         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     43         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE      8         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     12         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     16         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     20         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     24         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     28         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     32         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     36         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     40         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG
NODE     44         U1 = 0.000E+00  IH=-2      U2 = 0.000E+00  IH=-2      P3 = 0.000E+00  IH=-2
                    TH1=-0.450E+02  DEG        TH2= 0.353E+02  DEG        TH3= 0.000E+00  DEG

AT TIME   1.000E-01  NO ITERATION WAS REQUIRED
**** ELEMENT STRAINS, STRESSES, AND PRESSURES ****


ELEMENT NUMBER     1        H= 0.000E+00
```

```
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

ELEMENT NUMBER     2      H= 0.000E+00
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

ELEMENT NUMBER     3      H= 0.000E+00
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

ELEMENT NUMBER     4      H= 0.000E+00
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

ELEMENT NUMBER     5      H= 0.000E+00
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

ELEMENT NUMBER     6      H= 0.000E+00
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

ELEMENT NUMBER     7      H= 0.000E+00
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

ELEMENT NUMBER     8      H= 0.000E+00
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

ELEMENT NUMBER     9      H= 0.000E+00
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

ELEMENT NUMBER    10      H= 0.000E+00
      EPSX=-0.333E-01     EPSY=-0.333E-01     EPSZ=-0.333E-01     GAMXY=-0.667E-01    GAMYZ=-0.667E-01    GAMXZ=-0.667E-01
      SIGX=-0.333E+01     SIGY=-0.333E+01     SIGZ=-0.333E+01     TAUXY=-0.333E+01    TAUYZ=-0.333E+01    TAUXZ=-0.333E+01

         ****** NODAL DISPLACEMENTS ******

 NODE                  U                V                  W

   1             -0.144E-19       -0.144E-19        -0.144E-19
   2             -0.144E-19       -0.144E-19        -0.144E-19
   3             -0.144E-19       -0.144E-19        -0.144E-19
   4             -0.144E-19       -0.144E-19        -0.144E-19
   5             -0.578E-01       -0.577E-01        -0.577E-01
   6             -0.578E-01       -0.577E-01        -0.577E-01
   7             -0.578E-01       -0.577E-01        -0.577E-01
   8             -0.578E-01       -0.577E-01        -0.577E-01
   9             -0.116E+00       -0.115E+00        -0.115E+00
  10             -0.116E+00       -0.115E+00        -0.115E+00
  11             -0.116E+00       -0.115E+00        -0.115E+00
  12             -0.116E+00       -0.115E+00        -0.115E+00
  13             -0.173E+00       -0.173E+00        -0.173E+00
  14             -0.173E+00       -0.173E+00        -0.173E+00
  15             -0.173E+00       -0.173E+00        -0.173E+00
  16             -0.173E+00       -0.173E+00        -0.173E+00
  17             -0.231E+00       -0.231E+00        -0.231E+00
```

18	-0.231E+00	-0.231E+00	-0.231E+00
19	-0.231E+00	-0.231E+00	-0.231E+00
20	-0.231E+00	-0.231E+00	-0.231E+00
21	-0.289E+00	-0.289E+00	-0.289E+00
22	-0.289E+00	-0.289E+00	-0.289E+00
23	-0.289E+00	-0.289E+00	-0.289E+00
24	-0.289E+00	-0.289E+00	-0.289E+00
25	-0.347E+00	-0.346E+00	-0.346E+00
26	-0.347E+00	-0.346E+00	-0.346E+00
27	-0.347E+00	-0.346E+00	-0.346E+00
28	-0.347E+00	-0.346E+00	-0.346E+00
29	-0.405E+00	-0.404E+00	-0.404E+00
30	-0.404E+00	-0.404E+00	-0.404E+00
31	-0.405E+00	-0.404E+00	-0.404E+00
32	-0.404E+00	-0.404E+00	-0.404E+00
33	-0.462E+00	-0.462E+00	-0.462E+00
34	-0.462E+00	-0.462E+00	-0.462E+00
35	-0.462E+00	-0.462E+00	-0.462E+00
36	-0.462E+00	-0.462E+00	-0.462E+00
37	-0.520E+00	-0.519E+00	-0.519E+00
38	-0.520E+00	-0.519E+00	-0.519E+00
39	-0.520E+00	-0.519E+00	-0.519E+00
40	-0.520E+00	-0.519E+00	-0.519E+00
41	-0.578E+00	-0.577E+00	-0.577E+00
42	-0.578E+00	-0.577E+00	-0.577E+00
43	-0.578E+00	-0.577E+00	-0.577E+00
44	-0.578E+00	-0.577E+00	-0.577E+00

END

FILMED

3-84

DTIC